UNDERGROUND STORAGE TANK CLOSURE GUIDANCE

Iowa Department of Natural Resources
Underground Storage Tank Section
502 East 9th Street
Des Moines, IA 50319-0034
(515/281-8941)

September 2009

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How removal used to be conducted. The tank is perilously suspended by this track-mounted crane. The operator is on the other side of the fence. Let's just say everyone involved is very lucky to have walked away unharmed.

STEPS TO SUCCESSFUL UST CLOSURE
UNDERGROUND STORAGE TANK (UST) AND PIPING CLOSURE CHECKLIST

STEP 1 - Notification of Intended UST Closure Activity

√ Send DNR Form 542-1308 "Notification of Closure/Change-in-Service" to the UST Section of the DNR 30 days before the tank closure is scheduled to take place. The form must be filled out completely, accurately and signed by the owner or Responsible Party. **NOTE: It is imperative that you check with your local fire authority for any local requirements (permits, site inspections during excavation, etc.) prior to removal.**

STEP 2 - Preparatory Activities

√ Confirm the availability of those contractors you may be using on the anticipated closure date (tank removers, tank cleaners, excavators, certified groundwater professionals). UST permanent closure must be conducted by an Iowa licensed remover. Notify DNR of any changes to the date of closure for your UST system.

√ You must be a Certified Groundwater Professional in order to conduct or supervise closure sampling. Notify the Iowa Certified Lab of your choice of the types of samples you will need, and request the necessary sample containers. Testing for petroleum products shall be conducted by Iowa Methods OA-1 and OA-2 (if there has been low volatile fuels stored). Copies of these methods are available from the DNR.

√ Obtain the necessary sampling equipment and packing materials to store the samples at approximately 40 degrees Fahrenheit after collection and during shipment. Samples must be received by the laboratory within 72 hours of collection.

√ Make the Iowa One Call to have underground utilities identified and flagged. Iowa's One Call law requires at least 48-hour advance notice prior to any underground excavation (800-292-8989). This service is free and staffed 24 hours a day, seven days a week.

STEP 3 - Oral Confirmation of Closure Date

√ Contact (telephone) the DNR field office at least 24 hours prior to actual closure to confirm the removal date. This phone call must be made weekdays between the hours of 8:00 a.m. and 4:30 p.m. See field office locations and phone numbers on page 4.

STEP 4 - UST Closure Activities

Sampling Procedures *and* ***Tank Removal*** *are explained in greater detail on the following pages.*

√ Drain and flush piping into the tank, and disconnect piping from the tank. Remove product piping.

√ Empty the tank and purge all combustible vapors by inerting or venting through the vent line.

√ Monitor the tank for combustibility with a combustible gas meter until the tank atmosphere is less than 10% of the lower flammable or explosive limit LFL/LEL.

√ Remove tank appurtenances (gauge pipes, fill pipes, turbines, etc.) Leave vent line connected until the tank is purged.

√ Plug the openings and remove the tank from the excavation. Place it on a level surface and block it, or fill the tank to 100 percent capacity with an inert material.

√ Clean and remove the tank according to:

a. API RP 1604, *Removal and Disposal of Used Underground Petroleum Storage Tanks*,
b. API Publication 2015, *Cleaning Petroleum Storage Tanks*;
c. API RP 1631, *Interior Lining of Underground Storage Tanks*,
d. The National Institute for Occupational Safety and Health (NIOSH) *Criteria for a Recommended Standard…Working in Confined Space* may be used as a guidance for conducting safe closure procedures at some hazardous substance tanks.
e. NFPA 326: *Standard for the Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair*
f. NFPA 30: *Flammable and Combustible Liquids Code*, 30-93.

√ An Iowa Certified Groundwater Professional must supervise the collection of soil and groundwater samples, and send them to a certified lab for analysis within 72 hours of collection.

If contamination is discovered during soil or groundwater sampling, you must contact the DNR and report the contamination. To report a release, phone 515/281-8941 or fax to 515/281-8895**.** Forms for reporting a release are found on the UST Section website.

STEP 5 - Closure Report

√ Within 45 days of the tank or piping removal, submit a copy of the DNR's closure report form and the tank registration tags to the DNR. A copy of all reports and drawings must be maintained by the owner/operator for at least three (3) years.

√ Written confirmation of receipt of the closure report will be mailed to the owner after all these items have been received and reviewed by the department.

A Xerxes installed in 1992 is removed 10 years later at this site in Council Bluffs

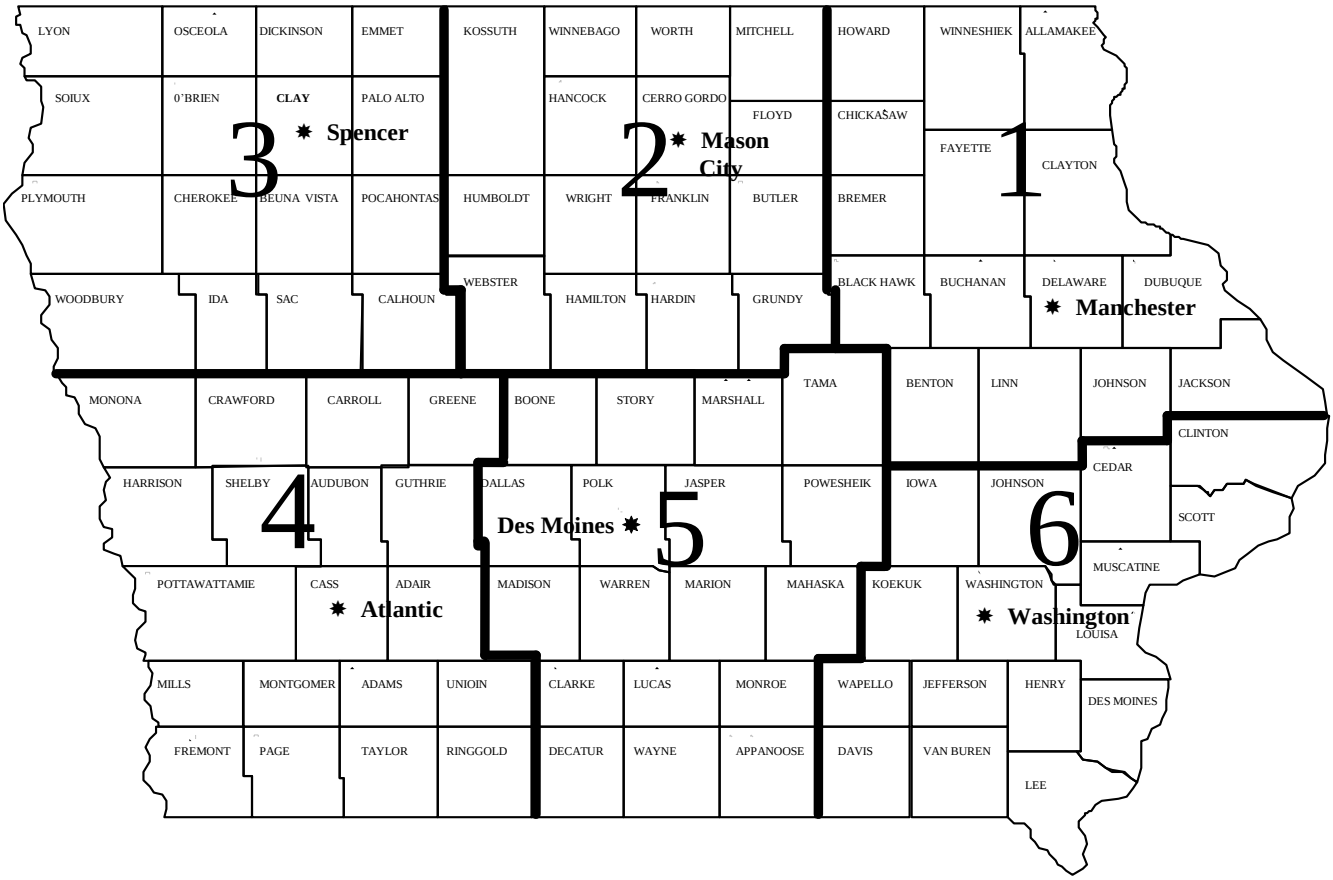
Address all correspondence and questions to:

IOWA DEPARTMENT OF NATURAL RESOURCES
UNDERGROUND STORAGE TANK SECTION
502 E NINTH STREET
DES MOINES, IA 50319-0034
Phone: 515/281-8941

There are six (6) DNR Field Offices that oversee UST permanent closures throughout Iowa. Phone the field office in the region where the UST closure will occur at least 24 hours in advance to inform them of the date of closure. This phone call must be made weekdays between the hours of 8:00 a.m. and 4:30 p.m.

Iowa Department of Natural Resources

Environmental Protection Division Field Office Map



Field Office 1: Manchester, IA 52057
909 W Main, Suite 4
(563/927-2640)

Field Office 2: Mason City, IA 50401
2300 - 15th Street SW
(641/424-4073)

Field Office 3: Spencer, IA 51301
1900 N Grand Ave Suite E17
(712/262-4177)

Field Office 4: Atlantic, IA 50022
1401 Sunnyside Lane
(712/243-1934)

Field Office 5: Des Moines, IA 50309
401 SW 7th, Suite 1
(515/725-0268)

Field Office 6: Washington, IA 52353
1023 W Madison
(319/653-2135)

IOWA DEPARTMENT OF NATURAL RESOURCES
UNDERGROUND STORAGE TANKS (UST)

UST SYSTEM CLOSURE GUIDANCE DOCUMENT

Introduction

- The purpose of this guidebook is to encourage safe UST removal. When regulated USTs are no longer needed they must be properly closed to avoid future safety and environmental hazards. Because these tanks contained flammable or combustible or hazardous liquids, UST removers must exercise the highest safety standards and practices. Accidents at UST removal sites are almost always avoidable. Safe work practices and an awareness of the potential hazards at the UST site will keep workers, the public, and the environment safe. This is merely a guidance document, and should be used for instructional purposes only. This document is not intended to be an in-depth explanation of the rules governing UST systems. You must also follow all the applicable Iowa rules and reference documents.
- The UST Section would like to thank the Oklahoma Corporation Commission, Petroleum Storage Tank Division, for permission to use their UST Removal Guidebook, July 2004.

References

The following publications are referenced in Chapter 567--135 IAC "Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks" or have been cited in this document and should be used as guides for further assistance in the permanent closure process.

- API RP 1604 (1996 or 2001) *Removal and Disposal of Used Underground Petroleum Storage Tanks*
- API Publication 2015, *Cleaning Petroleum Storage Tanks*
- API RP 1631, *Interior Lining of Underground Storage Tanks*
- API RP 2219, Safe Operation of Vacuum Trucks in Petroleum Service, 3rd Edition, November 2005
- The National Institute for Occupational Safety and Health (NIOSH) *Criteria for a Recommended Standard…Working in confined Space* may be used as a guidance for conducting safe closure procedures at some hazardous substance tanks
- NFPA 326: *Standard for the Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair*
- NFPA 30: *Flammable and Combustible Liquids Code*, 30-93
- Occupational Safety and Health Administration (OSHA)—has rules that you must be familiar with. In one way or another, UST removal will be covered by OSHA. Under certain circumstances, OSHA Standard 1910.120 applies. This is the Hazardous Waste Operations and Emergency Response (HAZWOPER) standard of 29 CFR
- *Tank Closure Without Tears*, New England Interstate Water Pollution Control Commission, 85 Merrimac Street, Boston, Massachusetts 02114, May 1988

SECTION I: Health and Safety Considerations

Inhaling high concentrations of petroleum vapors can have effects that range from dizziness to unconsciousness.

> *High occupational exposures to benzene have been associated with various human blood disorders, including an increased risk of leukemia. Very high levels have also been known to affect the central nervous system. Benzene is rapidly absorbed through the skin.*[1]

Benzene and tetraethyl lead are known cancer-causing agents. Although lead has not been used in gasoline since the mid-80s, lead residues may still be present in older tanks and in the soil around the tanks. To minimize exposure to hazardous substances:

- Avoid skin contact and inhaling the vapors.
- Keep petroleum liquids and hazardous substances away from your eyes, skin and mouth.
- Use soap and water or waterless hand cleaner to remove any petroleum product that comes in contact with your skin. Do not use gasoline or other solvents to remove oil and grease from your hands.
- Promptly wash petroleum-soaked clothing and properly dispose of rags.
- Keep work areas clean and well ventilated.
- Clean up spills promptly.

Flammable and/or combustible vapors will be present in the work area. These vapors could reach the explosive range before venting is complete and a safe atmosphere is reached. Make these precautions part of your daily routine during UST projects:

- Eliminate all potential sources of ignition from the area. Some examples of ignition sources at an UST site are smoking materials, non-explosion-proof tools, hot surfaces, static electricity, electrical equipment, and internal combustion equipment.
- Prevent a discharge of static electricity during venting of USTs. Be sure that all equipment used during venting is grounded. It is good practice to ground to the tank and to the earth.
- Prevent vapors from accumulating at ground level. Keep all tanks vented at least 12 feet above ground surface until ready to remove them from the excavation. Also, check weather conditions before beginning a project. Humid weather and calm winds can be especially dangerous.

Gasoline vapors are heavier than air and will tend to stay close to the ground surface unless other forces, such as wind, are helping to disperse them. This is especially critical during tank

[1] Closure of Undergound Petroleum Storage Tanks, API Recommended Practice 1604, Third Edition, March 1996, Reaffirmed, November 2001. Page 1.3.1.1

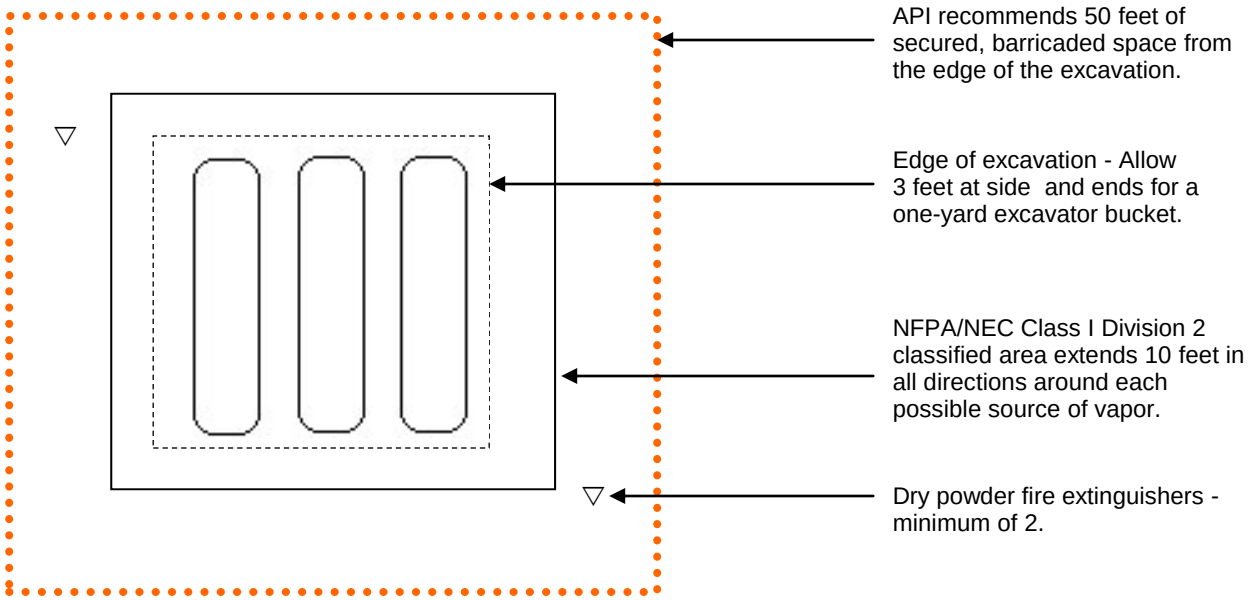
removals on a calm day. You should consider using construction-size portable fans to help disperse vapors on these days.

Plan ahead. Visit the site before removal takes place. Leave yourself enough room to work safely. Look at the whole site, and determine where and how each activity will take place.
Are there overhead obstructions, such as power lines, utility poles or a canopy? Make sure all underground utilities are located before excavating takes place.

Will any nearby buildings interfere with the excavation? The same formula for installing an UST near a building foundation applies to the removal excavation:

- Maintain a minimum distance of 5 feet from the edge of the excavation to the bottom of the building foundation.
- Then, the 45 degree line should strike the lower quadrant of the tank

Lay out the project on paper:



Barricades

- Erect and maintain barricades. Barricade as large an area as possible; API recommends 50 feet in all directions. Brightly colored barricade mesh fencing may be more expensive, but it is more effective. A-frames must be spaced close together to be effective in restricting passersby.

- Tank removals often take place at busy locations, including those open for business. Arrange your barricades so customers see where they are supposed to go, as well as where they are not supposed to go.

Fire Extinguishers

- Fire extinguishers are your first priority at all UST removals. Class B dry chemical extinguishers should be used on gasoline fires. The numerical rating of a fire extinguisher states the approximate number of square feet of a flammable liquid fire a non-expert person can expect to extinguish. A 40B extinguisher should extinguish 40 square feet of a flammable liquid fire. The Fire Marshal Division recommends a minimum of two 40BC fire extinguishers. Locate them at opposite corners of the project so they can be reached quickly. Check them every day to be sure they have not been tampered with, and are fully charged. Train your personnel in their proper use.

Fire Extinguisher Ratings

Class A Extinguishers will put out fires in ordinary combustibles, such as wood and paper. The numerical rating for this class of fire extinguisher refers to the amount of water the fire extinguisher holds and the amount of fire it will extinguish.

Class B Extinguishers should be used on fires involving flammable liquids, such as grease, gasoline, oil, etc. The numerical rating for this class of fire extinguisher states the approximate number of square feet of a flammable liquid fire that a non-expert person can expect to extinguish.

Class C Extinguishers are suitable for use on electrically energized fires. This class of fire extinguishers does not have a numerical rating. The presence of the letter “C” indicates that the extinguishing agent is non-conductive.

Class D Extinguishers are designed for use on flammable metals and are often specific for the type of metal in question. There is no picture designator for Class D extinguishers. These extinguishers generally have no rating nor are they given a multi-purpose rating for use on other types of fires.

Multi-Class Ratings

Many extinguishers available today can be used on different types of fires and will be labeled with more than one designator, e.g. A-B, B-C, or A-B-C. Make sure that if you have a multi-purpose extinguisher it is properly labeled.

This is the old style of labeling indicating suitability for use on Class A, B, and C fires.

This is the new style of labeling that shows this extinguisher may be used on Ordinary Combustibles, Flammable Liquids, or Electrical Equipment fires. This is the new labeling style with a diagonal red line drawn through the picture to indicate what type of fire this extinguisher is **NOT** suitable for. In this example, the fire extinguisher could be used on Ordinary Combustibles and Flammable Liquids fires, but not for Electrical Equipment fires.

Types of Fire Extinguishers

Dry Chemical extinguishers are usually rated for multiple purpose use. They contain an extinguishing agent and use a compressed, non-flammable gas as a propellant.

Halon extinguishers contain a gas that interrupts the chemical reaction that takes place when fuels burn. These types of extinguishers are often used to protect valuable electrical equipment since they leave no residue to clean up. Halon extinguishers have a limited range, usually 4 to 6 feet. The initial application of Halon should be made at the base of the fire, even after the flames have been extinguished.

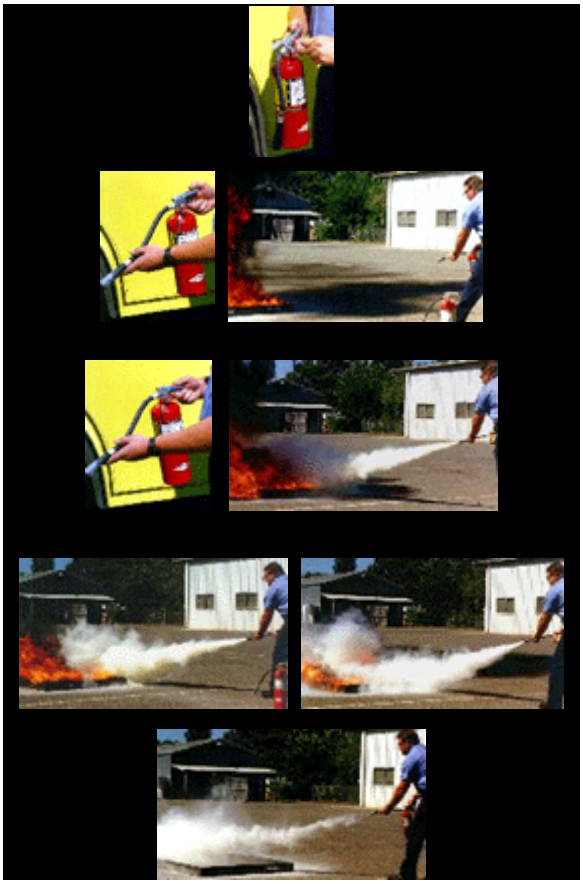
Water These extinguishers contain water and compressed gas and should only be used on Class A (ordinary combustibles) fires.

Carbon Dioxide (CO_2) extinguishers are most effective on Class B and C (liquids and electrical) fires. Since the gas disperses quickly, these extinguishers are only effective from 3 to 8 feet. The carbon dioxide is stored as a compressed liquid in the extinguisher; as it expands, it cools the surrounding air. The cooling will often cause ice to form around the "horn" where the gas is expelled from the extinguisher. Since the fire could re-ignite, continue to apply the agent even after the fire appears to be out.[2]

How to Use a Fire Extinguisher

Even though extinguishers come in a number of shapes and sizes, they all operate in a similar manner. Here's an easy acronym for fire extinguisher use:

P A S S -- **P**ull, **A**im, **S**queeze, and **S**weep



Pull the pin at the top of the extinguisher that keeps the handle from being accidentally pressed.

Aim the nozzle toward the base of the fire.

Stand approximately 8 feet away from the fire and **squeeze** the handle to discharge the extinguisher. If you release the handle, the discharge will stop.

Sweep the nozzle back and forth at the base of the fire. After the fire appears to be out, watch it carefully since it may re-ignite!

Success!

[2] Information provided from the Hanford Fire Department, operated by Fluor Hanford, Inc. for the US Department of Energy, Richland Operations Office, Document Number: INTERNET-1053.

Flash Point and Fire Point

The **flash point** is the lowest temperature at which a liquid gives off vapor to form an ignitable mixture with the air, near the surface of the liquid.[3] At this temperature the vapor may cease to burn (flash) when the source of ignition is removed. The **fire point** is a slightly higher temperature at which the vapor continues to burn after being ignited.[4] A liquid that has a flash point at or below ambient temperature is easy to ignite and will burn quickly, e.g., gasoline. A low flash point can indicate highly volatile material and presents a greater risk of fire.

A liquid with a flash point above ambient temperature is more difficult to ignite and presents less risk because it does not give off sufficient vapors, e.g., home heating oil or Fuel Oil No. 2.[5] Liquids with flash points above ambient temperature have to be heated to generate enough vapor to be ignitable.

The **fire point** of a liquid is the temperature at which ignition of vapors will result in continued burning.[6] The fire point is used to assess the risk of a materials ability to support combustion or continue to burn. Both values affect how the material or liquids may be shipped, stored and discarded.[7]

For our purposes, the flash point is a useful characteristic of liquid fuel, indicating at which temperature it will ignite or burn when a source of ignition is applied (flame, spark). The flash point helps us appreciate and understand the risks involved and the safety measures required in working around flammable/combustible liquids.

> The US Department of Transportation requires that all substances transported have a flash point determined and that any materials with flash points lower than 60 degrees C (140 °F) be handled with extra caution.

Examples of Flash Points

Fuel	Flash Point
Ethanol	55 °F (12.8 °C)
Gasoline	−40 °F (<−40 °C)
Diesel (1-D, 2-D and 4-D)	143 °F (>62 °C)
Jet Fuel	100 °F (>38 °C)
Kerosene (paraffin oil)	100–162 °F (>38–72 °C)
Vegetable Oil (canola)	3620 °F (27 °C)[1]
Biodiesel	266 °F (>130 °C)

[3] NFPA, 2008 Flammable and Combustible Liquids Handbook, 4.2.4.
[4] See 49 CFR-Chapter 1-Part 173.120. See also NFPA 30, 1.7.2.2.
[5] See Flammable and Combustible Liquids Code Handbook (NFPA 30 and 30A) 2008 Edition, 4.2.4.
[6] NFPA 30 Flammable and Combustible Liquids Code Handbook, 2008 Edition, A.4.2.4.
[7] Northern Technolgy & Testing Website, http://www.nttworldwide.com/tech2212.htm.

Classification of Flammable and Combustible Liquids

The classification of liquids is based on flash points. A flammable liquid is any liquid that has a flash point below 100 °F (37.8 °C). Flammable liquids are classified as Class I with sub-classifications (see table below). Flammable liquids, in other words, ignite easily and burn rapidly. A combustible liquid is any liquid that has a flash point at or above 100 °F.[8] Combustible liquids are classified as Class II or Class III.

Classification of Flammable Liquids (NFPA 30)[9]

Classification	Flash Point	Example
Class I Liquid	Below 100 °F (37.8 °C)	
Class IA	Below 73 °F (22.8 °C) and boiling points below 100 °F (37.8 °C)	Ethanol, Pentane
Class IB	Below 73 °F and boiling points above 100 °F (37.8 °C)	Gasoline, Isopropyl alcohol, Ethyl alcohol, Acetone, Toluene, Benzene
Class IC	73-100 °F	Turpentine, Xylene, Styrene, Butyl alcohol, Diethyl glycol

Classification of Combustible Liquids (NFPA 30)[10]

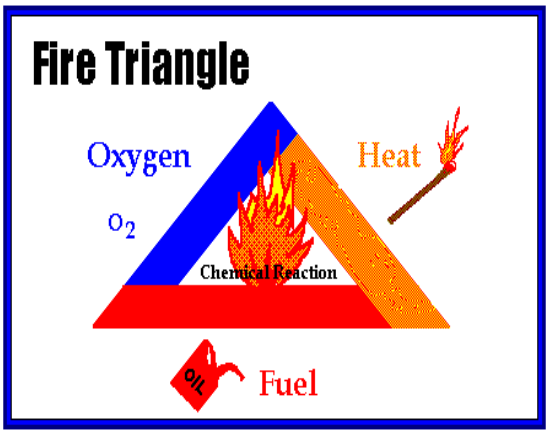
Classification	Flash Point	Example
Class II	101-140 °F	Kerosene, Diesel fuels, Pine tar, Stoddard solvent, Jet fuel, Fuel Oil 1, 2, 4 and 5
Class IIIA	141-199 °F	Fuel Oil No. 1
Class IIIB	200°F or above	Fuel Oil No. 6, Ethylene Glycol, Motor Oil

[8] NFPA 30, See 3.3.30.1 and 3.3.30.2 also 4.2.2 and 4.2.3.
[9] Ibid. 3.3.30.1
[10] Ibid.

The Fire Triangle/Tetrahedron

Four ingredients must exist at the same time in order to produce a fire:

1) Enough Oxygen to sustain combustion,
2) Enough heat to raise the material to its ignition temperature (ignition source),
3) A combustible material (petroleum), and
4) The chemical reaction that is fire.



The ***Fire Triangle*** might more appropriately be called the *Fire Tetrahedron.* Add in the fourth ingredient, chemical reaction, and you have a fire tetrahedron. The important thing to remember is remove any one of these ingredients, and you will not have a fire or the fire will be extinguished. For example, fire extinguishers put out fire by removing one or more ingredients of a fire triangle or tetrahedron.

Health and Safety Plan

- Prepare a site-specific Health and Safety Plan (HASP), and keep it onsite. The HASP must address the safety and health hazards of each phase of the project. The HASP must provide for pre-entry briefings before beginning any site activity, and at any other time it becomes necessary to keep employees aware of conditions. The plan must designate a site safety and health supervisor, and the safety supervisor must have the authority to shut the project down if personnel health or safety is jeopardized. The plan should also include a communications system, which can be hand signals if they are clearly understood. An emergency communications system, such as sounding a motor vehicle horn an established number of times, must be clearly understood. The HASP should be evaluated at least daily, and must be updated if changing conditions warrant.

- Employees must be advised of the chemical, physical and toxicological properties of each substance that is known or expected to be present on the site.

- Entering the excavation should not be an option. Besides the added cost of sloping and shoring, employees would be put at risk. Consider an approach that does not require your employees to enter the excavation.

Excavations are one of the most hazardous activities in the construction industry. The primary accident at an excavation site is cave-in. According to OSHA statistics, someone is usually killed in a cave-in. Excavations do not have to be deep, such as a tank pit, to be dangerous. Workers have been killed in trench cave-ins; you do not have to be buried to be killed. Trench cave-ins often result in massive lung and liver injuries; you can be crushed to death.

The OSHA Standard 29 CFR 1926.650-652 requires that employees in an excavation be protected from cave-ins. There are four sloping options available:

1) Slope the excavation at an angle not steeper than 1-½ feet horizontal to 1 foot vertical—expressed as 1-½:1. See 1926.650-652, Subpart P, Appendix B.
2) Slope the excavation in accordance with the OSHA simplified soil classification system, which ranks soils according to the stability. See 1926.650-652, Subpart P, Appendices A and B.
3) Use a design created and sealed by a registered professional engineer *in the state of the excavation*.
4) Use a site-specific design sealed by a registered professional engineer *in the state of the excavation.*

An excavation that will be entered can be sloped ½:1 (½ foot horizontal to 1 foot vertical) if it meets these criteria:

1) The excavation is in Type A soil (the most stable soil type after rock);
2) The excavation will not be open more than 24 hours; and
3) The excavation is no deeper than 20 feet.

Even in stable soils, however, if the excavation will be open longer than 24 hours, the sides must be sloped at least ¾:1.

Confined Space

Not only is it more expensive to slope or shore an excavation than to plan your removal project so no one has to enter the tank pit, you are putting your employees into a Confined Space situation. OSHA requires specific training for employees who must work in a Confined Space situation. Plan the UST closure so that no employees have to enter the excavation.

A Confined Space is *a space with limited ventilation, the potential to accumulate or contain a hazardous atmosphere, exits that are not readily accessible, and not meant for continuous human occupancy.* This includes excavations and trenches. There are many hazards associated with working in a Confined Space. Among them: ladder tip-over, buried utilities, falling equipment or material, and unplanned rescues. Instinctively rushing in to help someone who has become trapped in a Confined Space too often makes an already bad situation worse. Citing OSHA statistics again, half of all workers who die in Confined Space accidents are trying to rescue others.

Working in a Confined Space requires training; performing a rescue from a Confined Space takes more training. If employees absolutely must work in an excavation, train them in safety and self-rescue. Comply with all of the OSHA rules for Confined Space entry and activity; it is someone's life.

You must provide ladders, ramps or other safe means of exit in all trenches that are 4 feet deep or more. The means of exit must be within 25 lateral feet of workers. An earthen ramp can only be used if a worker can walk it in an upright position, and only if a competent person has evaluated it.

Regulatory Requirements

- An Iowa licensed tank remover must be on site during removal to conduct the closure process.
- Soil and groundwater sampling are required for all UST permanent closure and must be conducted or supervised by an Iowa Certified Groundwater Professional (CGWP). Make sure you have a CGWP scheduled to conduct sampling.
- At least 30 days before the tank removal, a Notification of Closure form must be completed and submitted to the department.
- Determine what receptors exist in the area of the tank removal. Is the site an active LUST site? Are there active groundwater monitoring wells on site? Will any of the wells interfere with UST permanent closure? Talk to the LUST project manager to discuss options.
- This is also the time to notify the fire prevention bureau of the local fire department and to begin the permitting process through all the local authorities.

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Above: A Des Moines tank removal excavation where five 8000-gallon and one 4000-gallon tanks once rested.
Below: some careful excavating was required in order to spare the driveway to a next door residence.

SECTION II: Pre-Tank Removal Procedures

Because of the nature of the flammable or combustible liquids that are stored in USTs, hazardous conditions can be expected to exist in the tank removal area. All personnel should be familiar with the potential hazards and be aware of the appropriate health and safety measures needed to ensure a safe working environment.

Safety concerns do not end once the tanks are out of the ground. Transportation must be handled safely, and storage of used tanks that are waiting to be destroyed must be done in a safe manner. Tanks can and will regenerate explosive vapors regardless of how they are cleaned. A used tank will never be vapor free as long as it is a tank.

- It is imperative that you check with your local fire authority for any local requirements (permits, site inspections during excavation, etc.) prior to removal.
- Go out to the site and conduct an inspection of the area where you will be working. Determine what equipment you will need, obstacles in the area. Are there receptors in the area such as private drinking water wells, groundwater monitoring wells or public wells? Iowa One Call will determine subsurface utilities.
- Review the API 1604 and NFPA reference books, which this guide relies on to help you accomplish a safe tank removal.
- Safety precautions were addressed earlier. They are good for you and the environment.
- You should have already made the Iowa One Call. The toll free number is 800-292-8989. The Iowa One Call center is open 24/7/365. Be ready to provide detailed location information, including the name of the property owner, the specific location of the excavation (9-1-1 address), and directions to the site. It is best not to call on Mondays, and not between the hours of 7 a.m. and 11 a.m. as they are the busiest.
- Ask Iowa One Call for a Joint Locate where you meet the locator on site. It is helpful to ask questions about subsurface utilities while the locator is on site.
- OSHA requires that you determine the location of any underground utilities that reasonably may be expected to be encountered before you open the excavation. It is one of the violations OSHA emphasizes [29 CFR 1926.651(b)(1) and (b)(2)].
- Local and state laws require that you determine the exact location of a utility before you excavate in the approximate location that was indicated by the utility locators. Remember that utility locators only have to mark within three (3) feet on either side of a utility to have done their job.

The same state law that requires utility owners to register their utilities and you, the contractor, to notify before excavating, also requires these colors to identify the utility locations.

Underground Utility Markings

Operator and Type of Product:	Identifying Color
Electric Power Lines, Cables, Conduit and Lighting Cables	Red
Gas, Oil, Steam, Petroleum or Gaseous Materials	Yellow
Communication, Alarm or Signal Lines, Cables or Conduit	Orange
Water, Irrigation and Slurry Lines	Blue
Sewers and Drain Lines	Green
Temporary Survey Markings	Pink
Proposed Excavation	White
Reclaimed Water	Purple

Electrical Safety

Disconnect all electrical service going into, under, or through the UST area. Do not just turn off the switches; pull the breakers. Use your voltmeter to confirm that electrical connections are disconnected; don't take chances. A licensed electrician may have to do all electrical work, including disconnects; check with local authorities.

Drainage of Product

Drain product piping back into the tank or vacuum the piping at the dispenser. If the piping system is pressurized, you will have to remove or open fully the STP check valve and open the shear valve test ports (if still present) at each dispenser island. If the system is suction and not safer suction, you will encounter a check valve at the tank top, which will require excavating to the tank top and removing the check valve.

Apply a cleaner and water solution at each dispenser island, to ensure a triple rinse of the piping volume. Vacuum the solution out of the piping and tank (if the vacuum truck is capable) or drain the solution into the tanks and then vacuum the solution.[11] You can also use Nitrogen (in place of a triple rinse) to purge the product piping (5psi maximum) and to ensure as much product as possible is drained into the tank. Nitrogen is more expensive, but would generate less waste that has to be removed from the tank. Avoid spilling fuel in the excavation area. The storage tank vents remain open and operational during this process.

[11] Refer to Safe Operation of Vacuum Trucks in Petroleum Service, API Recommended Practice 2219, Third Edition, November 2005.

A technician prepares the product piping for vacuuming/cleaning at the dispenser.

Vacuum hose connected to product line.

Capped product line.

Remove all liquids and residue from the tank. Use explosion-proof or air-operated pumps or vacuum truck. If you rinse the tank with water, you will be able to remove more of the residue. Do not add more than one (1) inch of water to the tank.

Be careful while pumping; it is likely that fresh air will enter the tank and bring the atmosphere inside the tank into the flammable range. Ground all pump motors and suction hoses to prevent a buildup of static electricity. You must ground your equipment to the tank, but it is also a good idea to ground to the earth as well. You may have to use a hand pump to remove the last few inches of liquid from the tank bottom.

If you use a vacuum truck, the area around the truck must be vapor-free. Locate the truck upwind of the tank. The suction hose must be grounded. The vacuum pump exhaust gases must be vented through a line of adequate size and at least 12 feet above ground surface. The vacuum vent should be located downwind of the truck and tank area.

Excavating

Remove the concrete/asphalt surface over the tank. It is a good idea to separate this material from the backfill material that may need special handling due to contamination. Select your on-site storage area carefully so you will avoid having to relocate any of the removed material to gain access to the tank excavation. All material must be kept at least two (2) feet from the edge of the excavation, or it must be secured to keep it from falling into the tank pit or causing a cave-in.

Excavate to the top of the tank; remove all tank top equipment. This includes the fill pipe and drop tube unless you are using an eductor to purge or vapor-free the tank and the ATG system. Remove all piping and conduit that is accessible and uncovered, except the vent line. This should include all piping that extends into the tank excavation.

The vent line must remain connected until the tank is purged. Plug all other tank openings as you remove the tank top equipment and risers. This will force the vapors to exit through the vent during the purging process. Keep in mind that you are creating an atmosphere that is more explosive than normal while you are purging the tank (next topic).

The objective at this stage of the project is to access and remove everything possible before continuing the excavation. This will avoid having to put personnel inside the excavation during any part of the removal project. If you avoid having personnel inside the excavation, you can avoid the sloping or shoring requirements you otherwise would have to comply with.

During the best of situations, explosive atmospheres are going to regenerate inside the tank. Continue purging as long as possible and monitor often. The important thing to remember is if you eliminate any of these four items, you will not have a fire. Keep all ignition sources (the chemical reaction phase of the tetrahedron) a safe distance away, and you will not have a fire. These include smoking material, tools that can cause a spark, nonexplosion-proof electrical equipment, and internal combustion equipment.

Purging and Inerting

Purging is the removal of flammable vapors up and away from a tank (through the vent line) either by drawing (eductor) or blowing (diffused air blower) the vapors out of the tank. Purging eliminates the fuel ingredient of the Fire Triangle. Purging is accomplished using an eductor or air diffuser which forces the combustible vapors out of the tank with positive pressure. A combustible gas indicator (CGI), which is also called an explosimeter, is a device used to measure combustible gases or vapor concentrations. Purging eliminates the fuel ingredient of the fire triangle.

Inerting is the diluting, removal or displacement of Oxygen from a tank with a non-reactive or inert gas, usually Dry Ice (carbon dioxide or CO_2) or Nitrogen (N_2). Inerting eliminates the Oxygen ingredient of the Fire Triangle. An Oxygen indicator is used to measure Oxygen levels. Inerting is often the procedure of choice when tank removal takes place in a densely populated urban area because petroleum vapors are not being forced out of the tank as they would be under purging.

When you are either purging or inerting, you are removing one of the ingredients in the triangle (either fuel/vapor or Oxygen) in order to control the atmosphere inside the tank and avoid an explosion. Where possible, the safest way to work around combustible vapors and to avoid an explosion is to eliminate both Oxygen and fuel from the Fire Triangle.

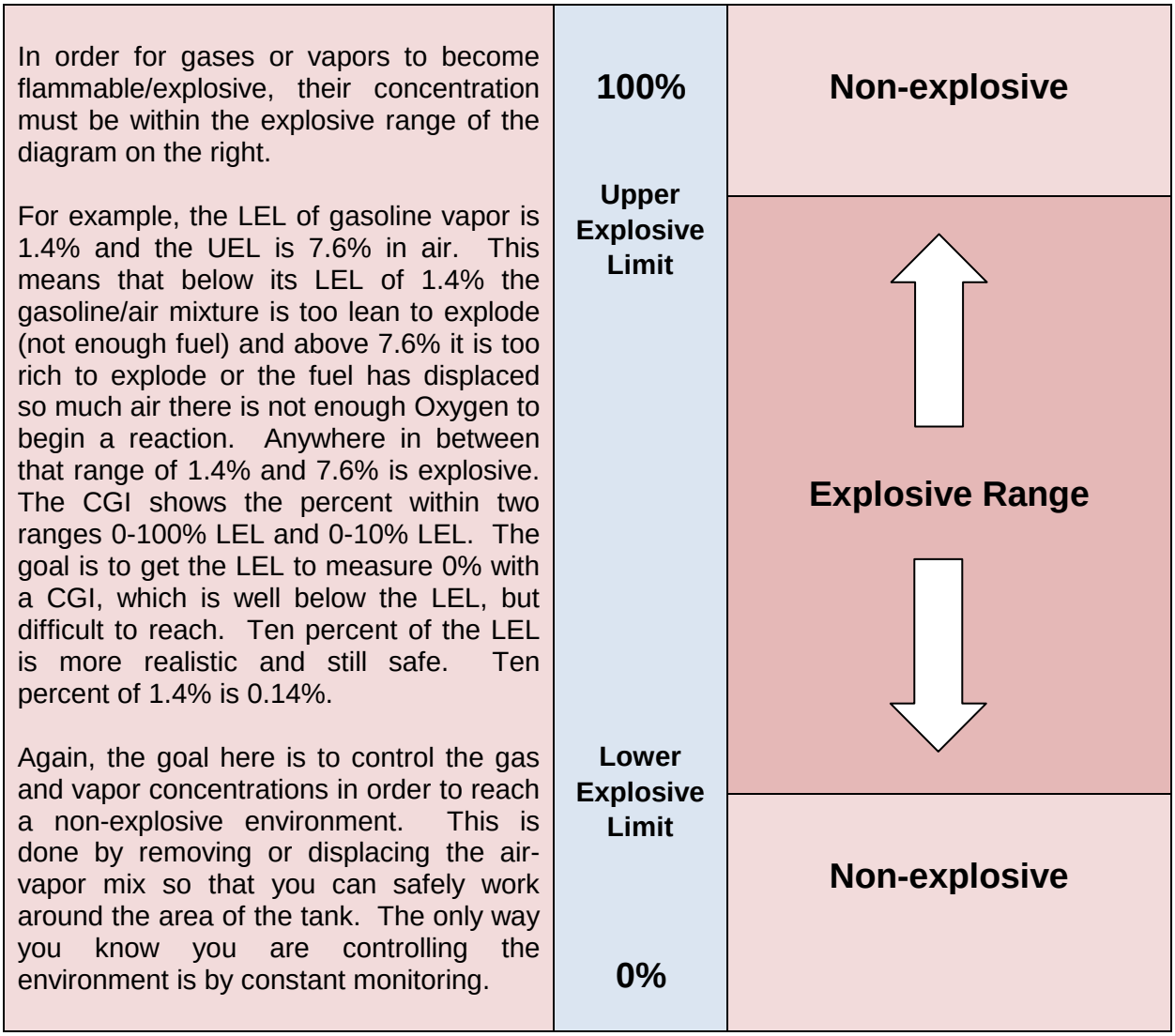
Once the tank is emptied and exposed to the air, the atmosphere inside the tank is a mix of product vapors and air--a potentially explosive mix. Combustion cannot occur unless all three ingredients of the Fire Triangle are present. We have Oxygen and fuel, but no ignition or heat. All it would take is a source of ignition or spark such as striking the tank with the backhoe. Before the tank can be removed from the tank pit, this potentially explosive atmosphere inside the tank must be controlled. The atmosphere inside the tank is controlled by purging or inerting, i.e., eliminating either fuel or Oxygen from the Fire Triangle so if a source of ignition is present, combustion cannot occur.

Lower and Upper Explosive Limits

In order for gases or vapors to become flammable/explosive, their concentration must be within the explosive range of the diagram on the right.

For example, the LEL of gasoline vapor is 1.4% and the UEL is 7.6% in air. This means that below its LEL of 1.4% the gasoline/air mixture is too lean to explode (not enough fuel) and above 7.6% it is too rich to explode or the fuel has displaced so much air there is not enough Oxygen to begin a reaction. Anywhere in between that range of 1.4% and 7.6% is explosive. The CGI shows the percent within two ranges 0-100% LEL and 0-10% LEL. The goal is to get the LEL to measure 0% with a CGI, which is well below the LEL, but difficult to reach. Ten percent of the LEL is more realistic and still safe. Ten percent of 1.4% is 0.14%.

Again, the goal here is to control the gas and vapor concentrations in order to reach a non-explosive environment. This is done by removing or displacing the air-vapor mix so that you can safely work around the area of the tank. The only way you know you are controlling the environment is by constant monitoring.



Purging and Monitoring Vapor Levels

When purging a tank, use a CGI to test the interior of the tank for vapor concentrations. Insert the CGI probe into the fill opening with the drop tube removed. Readings are taken from the bottom, the middle, and the upper levels of the tank. If it is a double wall tank, check the interstice for vapors. If the primary wall was breached, there could be product in the interstice giving off vapors.

The CGI will give a reading of % LEL. For a safe condition the reading should be below 10% of the LEL. See Appendix E for % LEL of combustible gases.

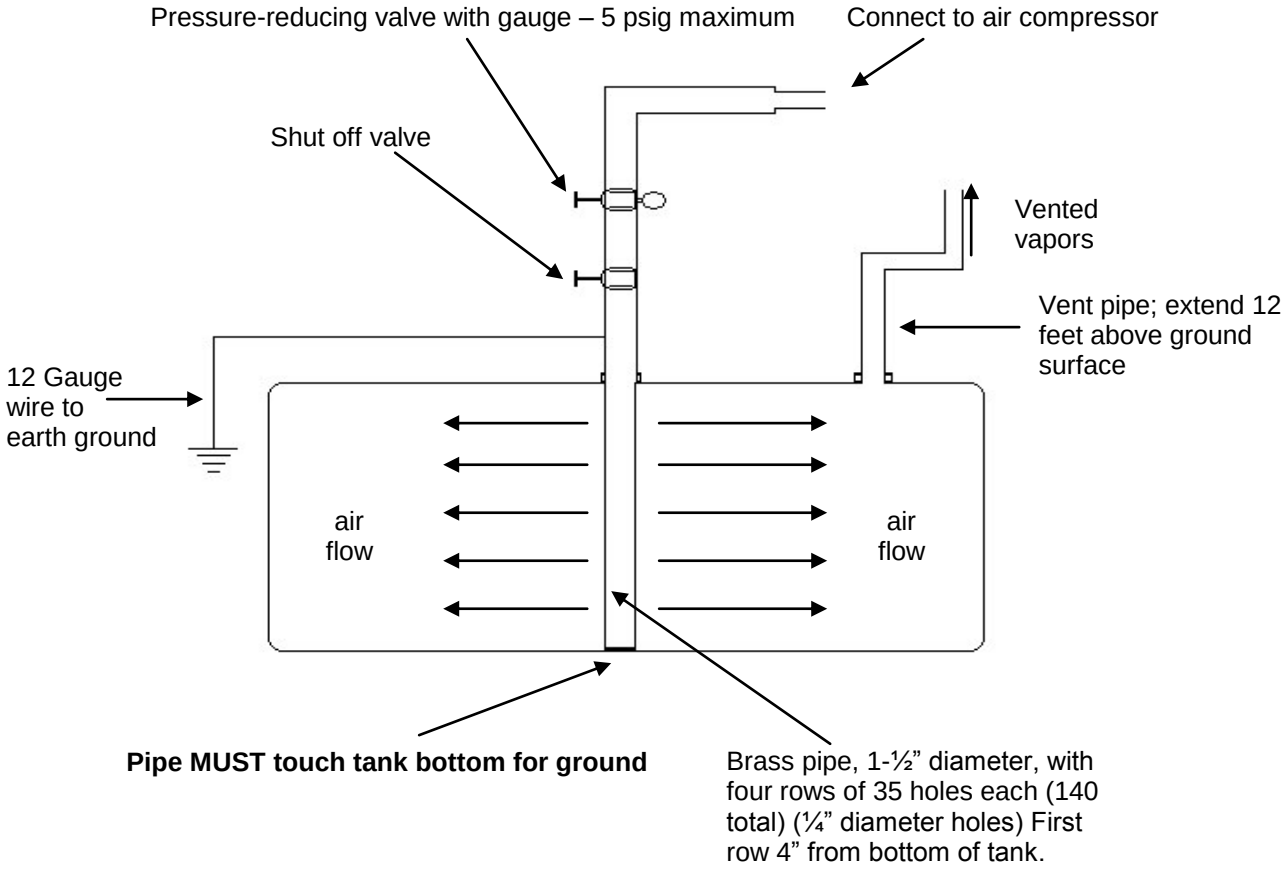
Caution must always be exercised when handling or working around tanks that have stored flammable or combustible liquids.

- Immediately before beginning work in the tank area or on the tank, check for vapor concentrations with a combustible gas meter or indicator (CGI).
- Even after purging or inerting, a tank can regenerate flammable vapors. Check them often.
- Both purging and inerting cause flammable vapors to be expelled from the tank. Vent all vapors at least 12 feet above grade and 3 feet above any adjacent roof lines.
- Keep the work area free of all sources of ignition.
- Never enter a tank that has been inerted with carbon dioxide (CO_2) or Nitrogen (N_2). Either of these methods depletes the Oxygen.
- Ground all equipment and use low air or gas pressures to prevent a buildup of static electricity.
- Never discharge a CO_2 fire extinguisher into tanks containing a flammable vapor-air mixture.
- If a tank has been inerted, a CGI may be misleading. Most CGI's require 10 percent by volume Oxygen to operate properly. Use an Oxygen indicator to assess a tank that has been inerted.
- When introducing compressed air or gases into the tank, make sure the tank doesn't over-pressurize. Do not exceed 5 psig (API 1631).

Purging a Tank with a Diffused Air Blower

Fresh air is pumped into the tank from the air compressor, which forces the explosive vapors out of the tank through the vent. Vent must be at least 12 feet above the ground. All other tank openings must be plugged. The drop tube and all other in tank equipment must be removed. The diffuser must be grounded to the tank bottom and to the earth. Pressure inside the tank should never exceed 5 psig. Always work with a dependable pressure gauge, and check it often during the process. Continue purging as long as possible up to actual tank removal.

A Positive Pressure or Diffused Air Blower

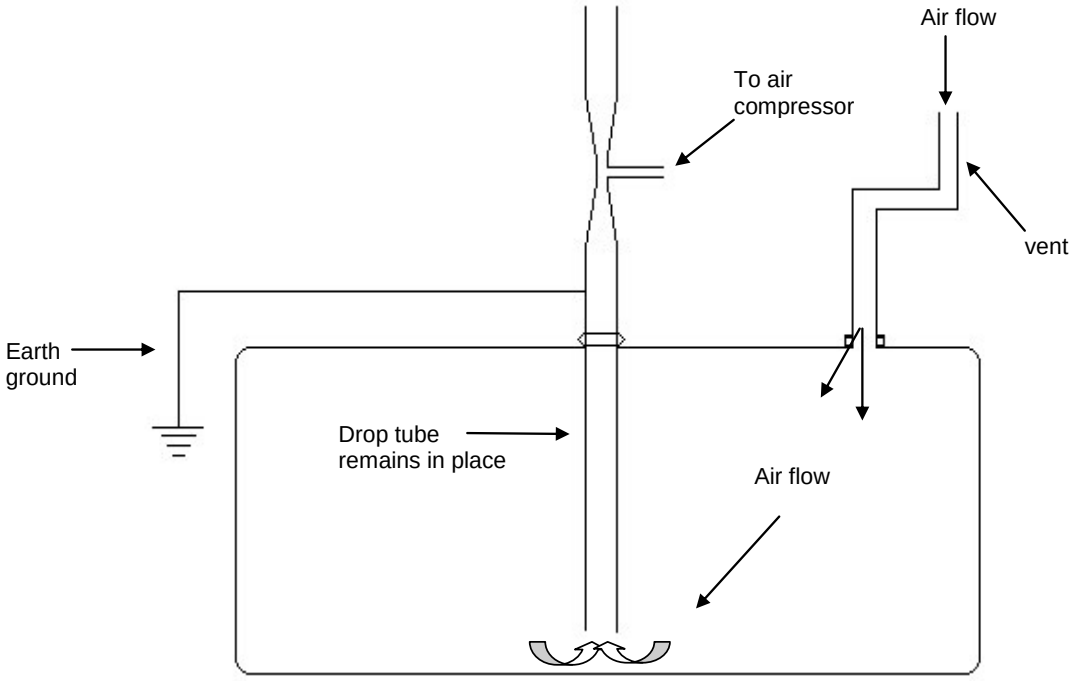


Purging a Tank with an Eductor-Type Air Mover

Air is pumped into the eductor from the air compressor. The venturi construction of the eductor causes a vacuum effect at the bottom of the tank. This draws the explosive vapors out of the tank through the top of the eductor, and draws fresh air into the tank through the vent. The top of the eductor must be at least 12 feet above ground surface. The drop tube is left in place for this method. All other tank opening must be plugged. The eductor should be grounded to the tank and to the earth. Continue purging as long as possible up to actual tank removal.

At right: photo of eductor in operation at a Des Moines tank removal.

Below: a diagram of an eductor-type air mover.



Inerting

One of the most-widely used methods of inerting a tank is by adding Dry Ice, which is carbon dioxide in solid (frozen) form. Inerting replaces oxygen with a non-reactive gas. Inerting with Dry Ice or compressed Nitrogen may be preferable to purging when removing tanks in densely populated urban areas where purging vapors might present an unsafe condition. Inerting displaces Oxygen and some of the vapors, while purging forces vapors out of the tank under positive pressure.

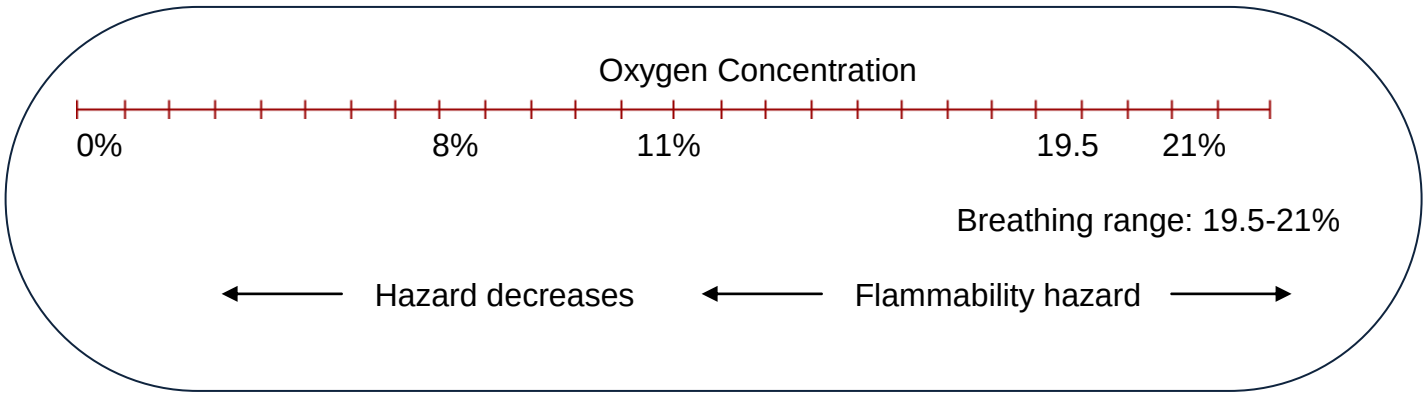
API and NFPA recommend adding 1½ to 2 pounds of Dry Ice per 100 gallons of tank capacity. The Dry Ice should be shaved or crushed and distributed evenly over the greatest possible area of the tank's interior. The Dry Ice should be inserted through tank openings at each end and in the center. As the Dry Ice vaporizes or warms, it releases carbon dioxide gas, which expels or displaces the oxygen out of the tank's vent and into the atmosphere. It takes longer to inert with carbon dioxide than it does with Nitrogen.

Both carbon dioxide and Nitrogen can be introduced into the tank as compressed gas from bottles as long as the pressure is controlled. Compressed gases should be introduced through a supply line near the bottom of the tank and at the opposite end from the vent. Use low pressure to avoid generating static electricity--don't exceed 5 psig. Ground the equipment and the tank.

Never discharge a CO_2 fire extinguisher into a tank containing flammable vapors. Static electricity from discharging a CO_2 fire extinguisher can ignite a flammable atmosphere and cause an explosion.

An inert gas such as CO_2 or N_2 will displace the Oxygen in the tank. The tank atmosphere will be Oxygen deficient. If you do have to enter the tank, make sure safety procedures for confined space are followed. Usually, if space permits, a tank is inerted, removed, and then ventilated with air (purged) where Oxygen is brought back into the tank. To determine the percent of Oxygen in the tank, the Oxygen meter is calibrated for the low range (1-10%). To determine if the tank can be entered and the air can support breathing without a breathing apparatus, the indicator is calibrated for the breathing range (19.5-21%).

Inerting lowers the oxygen concentration in the tank to a level below which combustion will not occur. Combustion will not occur below 11%, but to play it safe make sure the oxygen is 8% or lower.



Caution: Dry Ice is -109.3ºF (-78.5ºC). Traditional ice is 32ºF (0ºC). Skin contact with Dry Ice can cause severe burns.

Some tips on handling Dry Ice:

- Dry Ice does not melt, it sublimates. Sublimation is the process of going directly from a solid to a gas. Dry Ice bypasses the liquid form, giving it its name *Dry Ice.*
- Dry Ice will sublimate at a rate of 10 pounds every 24 hours in a standard insulated container. The more you have stored, the longer it will last.
- Plan to pick up your Dry Ice as close as possible to the time of inerting. Avoid opening and closing the container as much as possible.
- If you remove only a portion of the Dry Ice from a container, fill the empty space with wadded newspaper. Dead air space will cause the Dry Ice to sublimate faster.
- Do not store Dry Ice in an airtight container without proper ventilation. The carbon dioxide gas can cause an airtight container to explode.

Inerting and Monitoring Oxygen Levels

Air is roughly 21% Oxygen and 79% Nitrogen by volume. Safe breathing range is 19.5-21%. Most petroleum products need 11.5-14% Oxygen by volume to support ignition or combustion. Oxygen readings of 1-10% are safe for most petroleum products.[12] When Nitrogen is used to inert, ignition can take place above 11.5% Oxygen. The maximum recommended percent Oxygen is 9.[13] When CO_2 is used to inert, the percent above which ignition can take place is 14, and the maximum recommended percent Oxygen is 11.[14] A more conservative approach is to target a reading that represents 50% of the lowest level of Oxygen necessary to support combustion, which according to the figures above, would be from 6-7% Oxygen.

Do not take Oxygen readings through a drop tube. Take readings at a minimum of four locations in the tank:

1) One foot from the bottom of the tank;

2) At the tank's lowest end;

3) The middle of the tank's diameter; and

4) At the tank opening.

Monitoring Equipment (Review)

From simple to sophisticated, testing equipment can be potential lifesavers. Do not attempt to remove a tank without having both a combustible gas indicator (CGI) and an Oxygen meter.

The tank atmosphere and the excavation area must be tested regularly for flammable or combustible vapor concentrations until the tank is removed from the site.

CONTINUE TESTING until the tank has been loaded for transport. The tank atmosphere must be inert for transport.

[12] NEIWPCC, Tank Closure Without Tears: An Inspection's Safety Guide, May 1988.
[13] NFPA, Fire Protection Handbook, 14th Edition, Table 15-7B, 15-51
[14] Ibid.

The people doing the monitoring must be completely familiar with how to use the instruments. In other words, they must know how to interpret and apply the readings to ensure a safe working environment. Make sure the CGI is properly calibrated for the vapors you are working around, and that it is correctly scaled.

When you use a CGI, always test the environment for Oxygen content first to be sure you can rely on the instrument. CGIs may be misleading if the tank atmosphere contains less than 5% to10% by volume Oxygen, as would happen if you inert the tank. Make sure you have read the manufacturer's instructions for operating the instruments used for UST closure. Check the battery strength on the CGI and adjust the zero scale. The zero adjustment is made away from the tank pit where there is fresh air. When the needle is stable it is ready for use.

The CGI should be cleared after each reading. Move away from the vapor hazard area, move fresh air through the instrument and reinitiate the startup procedure. Do not contaminate the probe with liquid petroleum product as it will lead to false readings and foul the probe.[15]

Remove the drop tube and take **CGI readings** from:

1) The bottom,
2) The middle, and
3) The upper levels of the tank
4) Don't forget the interstice if the tank is double wall. If the primary wall was breached, you will have liquid and vapors in the interstice.

If the tank was inerted, use an Oxygen indicator to determine the Oxygen concentration. Readings that show the tank to be Oxygen-deficient should be safe. You have removed the Oxygen side of the Fire Triangle. A fire needs air with 12 to 14% Oxygen by volume to burn. Halve the percentage of what is needed to support combustion (6-7%) in order to safely work around the tank and to remove Oxygen from the Fire Triangle. To play it safe, always use both CGI and O_2 indicators.

Don't take Oxygen readings through a drop tube. Take **O_2 readings** at a minimum of four (4) locations in the tank:

1) One foot from the bottom of the tank;
2) At the tank's lowest end;
3) The middle of the tank's diameter; and
4) At the tank opening.

[15] See NEIWPCC, Tank Closure Without Tears, May 1988, p. 9.

Product drains from cut fiberglass piping (above), especially in the photo on the right. Make certain the piping is drained back to the tank or vacuumed and purged; it must not empty into the tank pit.

SECTION III: Tank Removal From Excavation

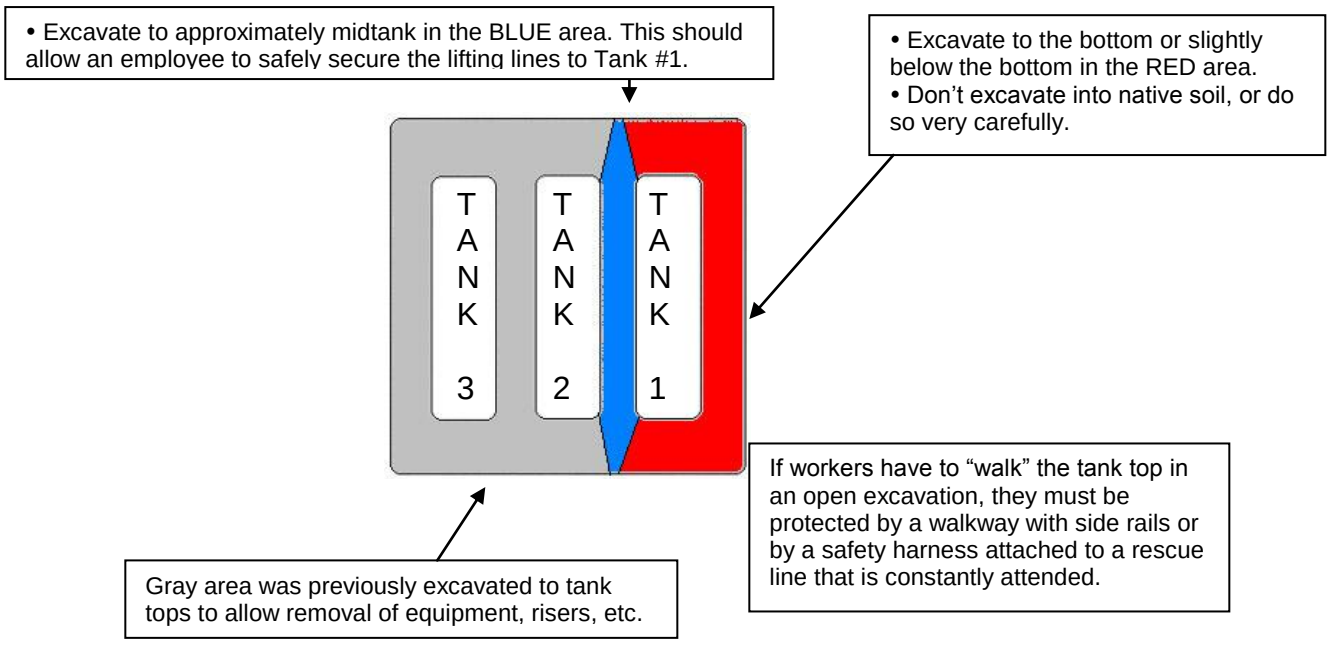
The tank is ready to be removed when the tank atmosphere is found to be Oxygen deficient as defined by an Oxygen reading of 6-7% (when inerting). Ten percent of the LEL (the maximum safe level) should be obtained before the tank is safe to remove from the ground (when purging).

During inerting, purging or removal procedures, all necessary precautions to prevent ignition in the area must be taken, including but not limited to: grounding and bonding of equipment, use of explosion-proof or intrinsically safe equipment, ambient air monitoring of the surrounding area, and pedestrian and traffic control. All weather and ambient atmospheric conditions must be evaluated prior to inerting or purging, including but not limited to air exchange, wind direction, and humidity.

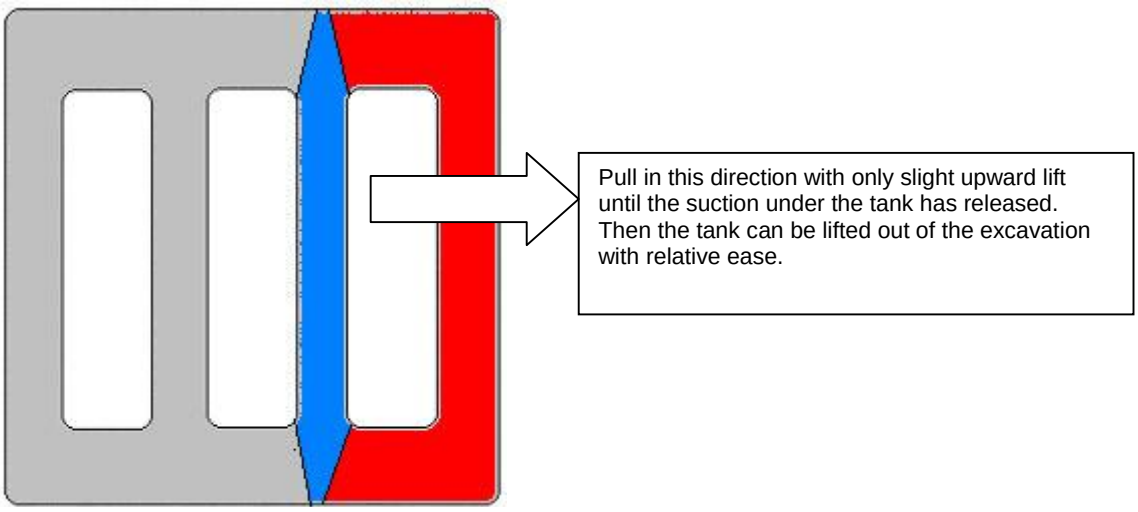
After the tank has been vapor-freed, before removing it from the excavation, remove the vent pipe and install a plug or cap with a ¼" hole. This hole will prevent the tank from becoming over-pressurized due to temperature changes. (API recommends a 1/8" hole. NFPA recommends a ¼" hole.)

The tank should always be positioned with this vent plug on top, including during subsequent transport and storage.

All of the other tank openings should already have been plugged and should remain plugged. Excavate around the tank to finish uncovering it for removal. If possible, working from one end of the tank excavation and removing one tank at a time will help you continue to keep your employees aboveground, out of and away from the excavation.



Rock & Roll
Rocking or rolling the tank toward the fully excavated area will cause the suction to be broken, and allow relatively easy lifting of the tank.



There are many ways to get a tank out of the ground:

- You must use equipment capable of safely lifting the tank. The tank should not be dragged.
- Close all openings except for the one ¼" vent mentioned above
- Quoting API: "Remove the tank from the excavation, and place it on a level surface."
- No smoking
- All excavated material must be kept at least two (2) feet from the edge of the excavation, or it must be secured to keep it from falling into the hole or causing a cave-in.

Piping

Remove all piping. You should already have removed piping that extended into the tank excavation. Use as much care as possible while excavating the piping. It can be very useful if you can identify corrosion holes or loose fittings that may have contributed to contamination at the site. Remember that you should be looking for contamination throughout the project. Dispose of the piping in the same manner as the tank.

Removing Sludge and Cleaning the Tank

A liquid waste product cannot be discharged upon or into the ground per Iowa Department of Natural Resources rules (567--64.3(1) IAC). If the recipient of the waste operates under an NPDES permit issued by this department, a copy of the NPDES holder's agreement to accept the waste material from the UST owner must be delivered to this department prior to disposal of the waste material.
It is possible to clean the tank while it is still in the excavation (if there is no room to safely conduct cleaning on site). The tank can be tipped and then rinsed, washing the sludge to one

end where it can be pumped or vacuumed out. You need to consider the space where the removal work is taking place and the air flow: is the physical area large enough to safely disperse vapors and not disturb the surrounding population; am I endangering the public if an explosion should occur? There may also be local or municipal requirements to observe.

During cleaning on-site, eductors are often used to force vapors up and away from the tank. Vapors can regenerate (even in the time it takes to move the tank from the excavation zone to the cleaning area) from the sludge at the bottom of the tank, from the trapped product at the bottom of the tank, or absorbed product through the tank walls (FRP).

If the tank has to be entered to manually remove sludge from the bottom of the tank or scale buildup from the tank walls, make sure it is done according to confined space requirements (suits, respirator, breathing support, safety line, buddy system) with a continuous stream of fresh air running through the tank. Cleaning the sludge from the tank and steam or triple rinsing will further reduce the possibility of vapors regenerating. Before transporting the tank, it must be properly labeled. Whatever condition the tank is in, it should contain a warning against its reuse. Lettering must be large and legible from a distance.

The exact wording is not as important as the information being conveyed.
API recommends this information:

- TANK HAS CONTAINED LEADED GASOLINE *
- NOT VAPOR-FREE
- NOT SUITABLE FOR STORAGE OF FOOD OR LIQUIDS INTENDED FOR HUMAN OR ANIMAL CONSUMPTION
- DATE OF REMOVAL: MONTH/DAY/YEAR

*Or other flammable or combustible liquid or hazardous substance. Use the applicable designation, such as "Diesel".

Tanks that have held leaded gasoline, or if the history of the tank is unknown, should also be clearly labeled with the following information:

- TANK HAS CONTAINED LEADED GASOLINE
- LEAD VAPORS MAY BE RELEASED IF HEAT IS APPLIED TO THE TANK SHELL

Obtain a "Clean Tank" Certificate

After the tank has been cleaned, make sure you have a signed certificate from the tank cleaning company that states the tank has been cleaned, and the sludge removed. Attach to the closure report copies of the appropriate manifests signed by the generator, transporter and receiving facility of the waste. Document the cleaning of tanks with photographs and include them with the closure report.

Tanks fit the definition of a confined space--limited means for entry and exit, and not a space for one to occupy for an extended time.

The air inside the tank (above) is being purged by an eductor. Explosive vapors are eliminated through the top of the eductor which extends above the tank. Fresh air is drawn in through the vent opening. A respirator is not used because the air is oxygen rich; however, an air purifying half mask is essential.

At left is a photo of the sludge the technician above is removing.

Disposing of Solids

The licensed remover is responsible for proper disposal of all project derived waste material. This includes, but is not limited to, excess excavated material, nonsalvageable equipment and materials, tank, any sand, liquid, fuel or sludge contained in the tank, and cleaning water used to clean the tank. Waste material must be transported and disposed of using transporters and disposal facilities which possess all required federal, state or local licenses or permits. Submit manifests certifying destination, receipt and disposal of materials.

Truck It

- The tank should be cut up, crushed (FRP) or removed from the site as soon as possible after removal. Check local requirements first.

- If a tank remains on-site overnight or longer, vapors may be regenerated from any of the liquids absorbed in the tank walls or from residues remaining in the tank. Always retest for a lower explosive limit (below 10%) before the tank leaves the site.

- Plug any openings in the tank walls that would allow any remaining residues to leak out during storage and/or transportation.

- Be sure the tank is properly secured before transporting, and that the 1/4-inch vent hole is located at the uppermost point on the tank.

- The transporter is subject to all local, state and federal transportation laws.

The tank being removed from a Hamburg site (above) was later secured for transport (below).

Top photo: Tank removal in Waukon. Planning a tank removal takes into account overhead power lines and canopies that can present risk for removers. Bottom photo: a documented release. This is the same tank as above with two quarter-size holes.

This photo shows a tank installed in the 1960s that was later lined. Plugs were used to repair the perforations before it was lined. The photo provides documentation the release at this site likely occurred before the tank was lined.

This is a scary sight, and is common with lined tanks.

Reporting the condition of the tank is important for determining whether a new release occurred.

Store It

Even though a tank has been vapor-freed, it will not remain vapor-free. Hydrocarbons are retained in crevices, walls and any scale buildup inside the tank, and can be released over a period of time.

If a tank is placed in storage, make sure it has been cleaned and residues removed. Only the 1/4-inch vent hole should be left open. Used tanks should never be stored in an area where the general public may have access.

Tank Reuse

Tanks can only be reused if they are recertified by the manufacturer. Tanks may not be used to store a regulated substance unless they are recertified. Tanks may not be used as drainage culverts or for storing food or liquids that are intended for animal or human consumption.

If you release or transfer ownership of the tank to another, such as a scrap iron dealer or salvage yard, prepare a Bill of Sale to transfer tank ownership. The Bill of Sale should include the purchaser's acknowledgement that the purchaser assumes all liability for the tank. The Bill of Sale should include a warning similar to this message recommended by API:

- TANK HAS CONTAINED LEADED GASOLINE*
- NOT VAPOR-FREE
- NOT SUITABLE FOR STORAGE OF FOOD OR LIQUIDS INTENDED FOR
- HUMAN OR ANIMALCONSUMPTION

*Or other flammable or combustible liquid.

Tank Disposal

Tanks must be properly disposed when they are no longer fit for storing flammable or combustible liquids. Whether you take them to a scrap iron dealer or some other acceptable facility, enough holes should be made in the tanks to render them unfit for future use. Use a Bill of Sale or Certificate of Destruction to transfer tank ownership.

Tanks must be transported from the site on the day of removal and rendered unfit for future use, not put up for sale. The owner of these tanks was told to remove them to a landfill or salvage yard and make them unfit for future use. Even after inerting, these tanks will regenerate vapors and remain a hazard to public safety.

SECTION IV: Sampling At Tank Removal

From collecting, to handling, to sanitizing, to preserving, proper soil sampling procedures must be followed to obtain meaningful results. Iowa *Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks* [567—135.15(3)] rules cover soil and groundwater sampling at tank removals. Owners and operators must contract with an Iowa Certified Groundwater Professional (CGWP) to conduct or supervise soil and groundwater sampling. Sampling requirements, procedure and practice are critical to preserving soil and groundwater samples for analysis and for further assessment if required. It is strongly recommended an Iowa Certified Groundwater Professional (CGWP) supervise the closure sampling requirements.

Visual Inspection

The purpose of a site assessment or closure sampling is to determine whether a release had occurred from any part of the UST system during its active life. It is important for the remover and CGWP to investigate each component upon removal for the presence of perforations, cracks, loose fittings or connections and damage of any kind which may have caused or precipitated a release.

The excavation must be inspected for any evidence of a petroleum release including stained or saturated soils, strong petroleum vapors and sheen. The presence of any of these is an indication a release had occurred and is reportable.

Soil and groundwater sampling must be conducted at every tank and piping closure. The only exception may be if the site is already an active LUST site and groundwater sampling required for the RBCA assessment has already represented a release from the any part of the UST system. In such a case, groundwater sampling may be waived. Talk to the LUST project manager for the specific site if there is a question about groundwater sampling.

Release Reporting

When evidence exists indicating there has been a release to the environment at the site of closure of the tank or piping, the contamination must be reported to the Department within 24 hours of discovery or six hours if a hazardous condition exists. This report should be reported by telephone to 515/281-8941 or by Fax to 515/281-8895.

When an immediate threat exists in conjunction with the contamination, such as explosive conditions present due to the contamination, public or private drinking water supplies are threatened, or an immediate danger to life or health exists due to contamination report it immediately to the Department of Natural Resources (515/281-8694). This emergency phone number is only to be used for reporting when an immediate threat such as described above is present. Upon receiving the report, the Department will provide further direction. UST professionals must report releases to owners and operators. There is a special form available in this guidance document (see Appendix F) for owners and operators to report releases. UST professionals must report releases to the department within 7 days of discovery on a special form included in this guidance document and also available on the department's website.

Soil Sampling Beneath the Tank

1) See the diagram below for the required number of samples beneath the tank. Sample the floor of the tank excavation between one and three feet (1'-3') into native soils.

2) Do not collect a groundwater sample from the tank pit (not perched zone, storm water or rain water). See groundwater sampling guidance. Groundwater samples must be collected downgradient and within 20 feet of the tank excavation, not in the tank pit.

3) If groundwater in the tank pit prohibits soil sample collection, use the down-gradient sidewall to take the sample immediately above the soil-water interface, and one to two feet (1'-2') into the sidewall.

4) If the UST is resting on a concrete pad, and the pad is to be left in the ground, soil samples must be collected from around the concrete pad according to close-in-place procedures.

Soil Sampling Locations and Distances

(Closure by UST Removal)

TANK CAPACITY (Gallons)	**# OF SAMPLES**	**LOCATION**	**EXAMPLE ("X" = Location of Sample)**
1,000 or less	1	Center of Tank	X
1,001 to 8,000	2	1/3 from ends	X X
8,001 to 30,000	3	5 feet from the ends and at the center	X X X
30,001 to 40,000	4	5 and 15 feet from ends	X X X X
40,001 or greater	5	5 and 15 feet from ends and at center	X X X X X

Samples are waived beneath the tank when water fills the tank pit. Collect samples at sidewalls if native material is accessible, and at areas with obvious contamination.

Piping

1) Collect one (1) grab sample at each connection or elbow, or at least one (1) grab sample per 20 linear feet of trench.
2) Collect samples one (1) to two (2) feet below trench in native soil.
3) Collect a sample at each dispenser on the supply side.
4) Samples should be collected from worst-case locations, such as elbows, joints, dispensers, and other line fittings near the dispensers, as well as where indications of contamination such as petroleum odors and staining have been detected.
5) If existing FLEX piping is being removed or abandoned in place, a line test conducted immediately prior to removal which demonstrates the product line(s) (PRIMARY and SECONDARY) are tight may be used in lieu of native soil sampling. If either primary or secondary pipe fails, native sampling is required. Soil sampling is required wherever contaminated soil is observed in the backfill. Non-FLEX pipe must follow routine sample requirements for piping.
6) A groundwater sample(s) must be collected downgradient of the piping and dispensers, and representative of a release from any dispenser and piping location.

With fewer joints and unions, flex pipe removes some potential leak locations and worries, except during construction when a stake can be pushed through flex pipe.

Dispensers

Collect at least one (1) sample below each dispenser, on supply side.

Backfill

The DNR may require that backfill be disposed of properly or land farmed. DNR prefers screening removed backfill using PID/FID instrumentation. Instrument readings less than 10 ppm suggest backfill could be reused. Lacking PID/FID instrumentation, visual/olfactory evaluation may be appropriate. Laboratory analyses indicating values less than Tier 1 values are also acceptable.

1) Determine whether excavated backfill can be returned to tank pit or whether it should be managed as contaminated soil. Excavated contaminated soils must be properly managed according to 567--Chapter 120 IAC. Certainly, petroleum-saturated, strong petroleum vapor and heavily stained backfill may not be returned to the tank pit. If there is a question about whether the soils can be returned to the tank excavation, contact the DNR field office in the region of the tank removal or the central office.

   Prior to landfarming contaminated solids, a permit from the Department's Solid Waste Section must be obtained according to 567-Chapter 120. The Department issues two types of landfarm permits as follows:

   a. Multiuse landfarm permit. A multiuse landfarm permit is issued for a landfarm designed to be used for more than one application of PCS. This permit requires that each application of a particular source and type of PCS be landfarmed in separate landfarm plots. If a facility has a multiuse landfarm permit, then the landfarming process may be repeated after the PCS has been remediated. A multiuse landfarm permit is not for a facility located at a sanitary landfill.

   b. Single-use landfarm applicator permit. A single-use landfarm applicator permit is issued to an entity that is then permitted by the department to land apply PCS to create one or more single-use landfarms. This permit requires that single-use landfarms be used for only one application of a particular source and type of PCS. This permit requires that no other PCS be applied within 15 feet of the area of land used as a single-use landfarm until the single-use landfarm is closed pursuant to rule 567—120.12(455B).

   c. A landfarm permit is not required for petroleum contaminated soil removal activities that involve less than 3 cubic yards of contaminated soil.

   For a permit application or a list of already approved landfarm sites, visit http://www.iowadnr.gov/waste/sw/permitting.html or call 515/281-8150.

2) Petroleum contaminated soils may be accepted at a local sanitary landfill for remediation provided the landfill management is authorized to remediate contaminated soil. The landfill should be contacted prior to delivery of the waste products. Additional information may be obtained by calling the Solid Waste Section of the Department of Natural Resources (515/281-8941). Ask for weight ticket, disposal receipts to document proper disposal.

3) Owners and operators may remove up to one (1) foot of the native soils surrounding the tank pit. If contamination is limited and localized, and additional sampling following this one-foot removal may lead to decreased contaminant levels, it may be practical and economical to remove this additional one foot. Confirmation samples should be collected from the areas showing the greatest contamination. Soil removal beyond one foot is considered *expedited corrective action*, and must be conducted according to 135.12(11). The contamination and over-excavation must be reported to the Department prior to backfilling the excavation. Appropriate soil sampling must be completed and laboratory analyzed from the areas showing the greatest remaining contamination.

Sampling Exemption

If approved external leak detection equipment has been in place for the affected UST system for a minimum of 90 days prior to the date of receipt of the closure notice by the DNR, the equipment is operational, and the required monitoring and records have been maintained, the soil and groundwater sampling requirements may be satisfied by submitting to the department:

1) Form 542-1308 (Notice of Closure or Change-in-Service)
2) Complete record of the monitoring results (minimum 90 days),
3) The specifications of the monitoring equipment,
4) Monitoring method used,
5) Verification that no release to the environment has occurred by providing a notarized statement from the owner to that effect (attached).

Soil Sampling Equipment

1) Tool capable of digging shallow hole for sampling purposes; and
2) Soil sampler kit containing a soil sampling tube with a removable rigid acetate liner. The sample tube must be at least 18" long and capable of removing a soil core of at least 0.9-inch in diameter, or
3) Sample containers with Teflon septa-lined lids obtained from the laboratory to which the samples will be submitted for analysis.
4) Equipment to maintain samples at approximately 40 degrees Fahrenheit until delivery to the laboratory within 72 hours.

Contact the certified lab of your choice for information on sampling equipment and containers.

Soil Sampling Options

1) Sampling Soil Kit (soil sampling tube with acetate liner)
Using the soil sampling kit, collect a sample from the base of the sampling holes. Insert a rigid acetate liner into the soil sampling tube by pushing the sampling tube at least two-thirds of the way into the soil. The sample should be collected by one of the following methods in the tank excavation:
   - Strap or bracket the sampling tube with liner to a backhoe bucket and use the bucket as a lever to push the tube completely into the soil for sample collection; or with the backhoe, collect a full bucket of soil from the bottom of the excavation. Insert the sampling tube and liner at least two thirds of the length into the top center area of the bucket. The "T-handle" with the sampler kit may have to be attached to the tube to collect the sample.

Do not allow employees to enter the excavation to obtain soil samples. In most circumstances, OSHA requirements pertaining to shoring or sloping of excavation walls must be followed; not to mention the hazardous atmosphere.

   - Remove the acetate liner containing the soil sample and cut off any excess liner not containing soil. Immediately cap each end of the liner with caps provided and seal the caps with friction tape. If the liner does not contain at least two thirds of the original liner length, repeat the sample collection.

2) Sample Containers with Teflon Septa-Lined Lids
For samples collected in glass containers, the appropriate containers must be obtained from the laboratory doing the analyses. The soil must **always** be compacted into the container tightly with the soil filling the container completely. No void spaces should be visible in the container, and the lid must be secured tightly. **A minimum of one sample container per sampling point is required. Additional containers per sampling point may be required by the laboratory.** Since sample collection may be difficult from deep excavations, soil cuttings from the tip of the auger may be placed in the lab containers when such difficulties are encountered.

Label each sample as it is identified on the dimensional drawing. Indicate the facility name, tank owner, date, and the substance stored in the underground tank. Maintain the samples at approximately 40 degrees Fahrenheit, but do not allow the samples to freeze.

Prepare the samples for delivery to the laboratory by placing the containers (with samples) into an iced cooler or chest for shipment at approximately 40 degrees Fahrenheit. If the acetate liner/sample does not fit entirely into the cooler, the liner/sample may be cut, provided the liner/sample is clearly labeled identifying the sample orientation (i.e., top and bottom of original sample) in order that the laboratory may analyze the appropriate portion of the sample. Samples must be shipped to insure their arrival at the laboratory within 72 hours of collection.

Groundwater Sampling Requirements

Groundwater Sampling Equipment Needed

1) Auguring tool or drilling rig capable of boring to groundwater. The boring must be done by a certified well contractor according to Chapter 567--82(455B) Iowa Administrative Code, except that a person may construct or reconstruct a well, on their own property without being certified. Local health codes may also require a well construction permit.
2) A clean, commercially manufactured bailer that is transparent and suitable for the substance stored in the tanks.
3) Several sampling containers with screw-top Teflon-lined lids obtained from the analytical laboratory to be used.
4) Equipment to maintain samples at approximately 40 degrees Fahrenheit during collection and delivery to laboratory.
5) Scrub brush, detergent and a supply of distilled water.

Procedure for Groundwater Sampling

1) Sampling of groundwater must be done outside the tank excavation or tank cluster via at least one (1) monitoring well downgradient, but within 20 feet of the excavation (See Appendix C). Groundwater sampling must also be representative of a release from the product piping and dispensers; more than one groundwater sample may be required.

If bedrock is encountered before groundwater, see Appendix B.

2) For a tank cluster, the borehole should be at the midpoint of the side down-gradient of the cluster. Draw a dimensional overview of the tank excavation area indicating the position of the boreholes. Tank cluster refers to an installation containing more than one tank where the separation distances between the tanks are less than or equal to ten (10) feet.
3) Field screening must be used to determine the vertical extent of soil contamination and assist in selection of samples for laboratory analysis. Soil core samples must be screened the entire length of the boring and drilling must continue until the contamination is no longer detected (vapor readings are below 10 ppm). Acceptable field vapor screening instruments include photoionization detectors (PID), flame ionization detectors (FID), or other similar vapor analyzers. Equipment must be evaluated against a standard at the beginning and end of each day at the site and, if necessary, calibrated according to

the manufacturer's specifications. Observations and vapor screening results must be documented on the boring logs.

4) After well is completed and allowed to achieve stabilization, determine the static water level (SWL) and presence or absence of free product using an oil/water interface probe or other appropriate equipment. Gently lower the probe into the well to determine the SWL. Once SWL measurements are completed the well must be developed and purged prior to sampling.

5) Water levels must be measured, and monitoring wells must be purged of stagnant water in the casing prior to collecting groundwater for sample analysis. Purging must continue until water quality measurements have stabilized. Once the well has been sufficiently purged, groundwater should be allowed to recharge to the original measured static water level before sample collection.

6) Collect a sample of the water by lowering the bailer into the borehole until it is just under the water's surface. Remove the bailer, and check for free product/sheen floating on the sample's surface. If sheen or free product is observed, contact the DNR at 515-281-8941. If no sheen or free product is observed, pour a portion of the water collected from the bailer into the sampling containers provided by the laboratory.

7) Label the water sample according to the dimensional drawing, and include on the label the date, facility name, tank owner's name, and substance stored in the tank. Fill each container so that there is no air space in the vial, but do not overfill. Secure the lid on each container after filling. Repeat the sampling procedures above for each borehole if more than one borehole is drilled downgradient of the tanks. If a disposable bailer is not used, the bailer must be thoroughly cleaned with soap and detergent, and rinsed with distilled water prior to sampling each additional borehole.

8) Prepare the samples for delivery to the laboratory by placing the containers into an iced cooler or chest maintained at approximately 40 degrees Fahrenheit. Samples must be shipped to the laboratory within 72 hours of collection.

9) After the boreholes or wells are no longer in use, fill from bottom to top with neat cement or bentonite products, unless the hole seals itself by removing the casing.

Laboratory Procedures for Testing Soil and Groundwater Samples

Soil Samples

Soil samples must be analyzed for high volatile petroleum compounds (gasoline) with each concentration reported separately (benzene, ethylbenzene, toluene, xylene) using analytical Method OA-1 regardless of the product stored in the tank. If any grade of diesel fuel, fuel oil, kerosene, oil, and mineral spirits had ever been stored in the tank, soil samples must be analyzed for Total Extractable Hydrocarbons (for the product stored) using Method OA-2. If there is a history of use other than gasoline or if it is unknown whether any product other than gasoline was stored in the tank, soil samples must be analyzed for Total Extractable Hydrocarbons using Method OA-2.

Water Samples

Water samples must be analyzed for benzene, toluene, ethylbenzene and xylene using analytical method OA-1. If any grade of diesel fuel, fuel oil, kerosene, oil, and mineral spirits had ever been stored in the tank, groundwater samples must also be analyzed for Total Extractable Hydrocarbons for the product stored using Method OA-2. If there is a history of use other than gasoline or it is unknown whether any product other than gasoline was stored in the tank, groundwater samples must be analyzed for Total Extractable Hydrocarbons using Method OA-2.

Non-petroleum Substances

For tanks containing non-petroleum regulated substances, the substance and its breakdown constituents must be analyzed using the appropriate EPA and DNR approved analytical methods.

Soil and groundwater samples exceeding the action levels below, may require further investigation and/or corrective action. The owner/operator, insurance company and CGWP will be notified in a letter if there are additional requirements.

Contaminant Corrective Action Levels

Volatile Hydrocarbons	**Soil (mg/kg) ppm**	**Groundwater (ug/L) ppb**
Benzene	0.54	5
Toluene	42	1000
Ethylbenzene	15	700
Xylene	No Limit	10000
Low Volatile Hydrocarbons		
Waste Oil	No Limit	400
Diesel	3800	1200

SECTION V: Tank Fill-in-Place

Filling tanks in place is less preferred than removal of the tanks. Any change of ownership in the property will have to face the fact that the tanks are still in the ground, albeit filled with an inert material instead of a petroleum product.

Filling in place may be just as expensive as removal. Even during fill in place, the overburden may have to be removed to access the tank top and to fill the tank completely with the inert material.

The tanks may interfere with construction in the future, and it is difficult to remove tanks that are filled with sand or mortar. Essentially, what remains after tanks are filled in place is a solid waste underground--not very attractive for a prospective buyer.

Nonetheless, when removal is hazardous due to utilities or other barriers or when it compromises another structure, to fill in place may be the only option.

The tank owner must submit the Notification of Closure Form (indicate *Fill In Place* on the form) 30 days before the tank fill-in-place procedures are to begin.

Excavate to the top of the tank if necessary. Drain and flush piping back to tank. Remove all tank top equipment and piping.

Remove liquids and residues from the tank and clean[16]

To proceed with fill in place, flowable mortar, clean sand or other fill material approved by the DNR may be used to completely fill the underground tank to 100% of capacity.

Sand is generally available, will flow readily, and is a suitable material if it is clean and free of rocks (which would prevent leveling out in the tank). The sand should be introduced dry. As it nears the top of the tank, the sand can be washed into the tank with NOMINAL amounts of water and puddled causing it to flow to the ends. Use of large amounts of water is prohibited as it will cause the tank to be filled with water before it is filled with sand.

Purge the tank and surrounding area of all vapors, and monitor with a CGI continuously during the procedure. Keep the atmosphere in the tank below 10% of the LEL and/or 6-7% Oxygen (see Purging and Inerting).

Examine the tank for two openings, one at each end of the tank. One opening must be large enough to accept the fill material. Openings at the top of the tank may be too small and/or too few to introduce the inert material and to fill the tank to 100% capacity. The other opening is an observation hole to ensure the tank is filled to capacity. If sufficient openings do not exist, excavate to the top of the tank and make the openings. Use explosion proof, non-sparking tools to increase or enlarge the number of openings (you are still monitoring the atmosphere). Cap or plug all other openings.

[16] See American Petroleum Institute publications 2015 and 2219 for safety precautions during removal and fill in place and for vacuum truck operating and safety practices.

Clean the tank according to the procedures explained above (see API #2015, *Cleaning Petroleum Storage Tanks* (see Reference page).

Fill the tanks using concrete, sand or flowable mortar or other approved material until the inert material flows out of the observation hole.

Submit a closure report to the DNR within 45 days of the close in place. You may obtain extra copies of the closure form through our web site http://www.iowadnr.com/land/ust/index.html.

Soil Sampling Requirements

1) Drill borings within three (3) feet of the tank. The number of borings will depend on typical size of excavation for the number and sizes of tanks buried. For number of soil samples, see Soil Sample Locations for Filling in Place chart (located in Section IV of this report).

2) Place borings in native soil, to a depth of one to three feet (1'-3') below tank bottoms. Collect a sample at the interval of highest contamination indicated by PID readings.

3) Drill a boring every 10-20 feet along piping runs, at a depth of one to three feet (1'-3') below trench bottom (see Flex Pipe Procedures).

4) Drill a boring within three (3) feet of each dispenser (supply side). If dispensers are located within 15 feet of each other on same fuel island, collect one sample per fuel island, on the supply side.

5) Closure Confirmation Report. Within 45 days of tank or piping removal, submit the completed closure report form along with the analytical report and metal tags from the tanks to the DNR (address on front page of this document).

You should always sample where contamination is observed, indicated, or is most likely to be present.

Soil Sample Locations for Filling in Place, or When a Concrete Pad Interferes with Sampling Beneath UST

TANK CAPACITY (Gallons)	# OF SAMPLES	LOCATION	EXAMPLE ("X" = Location of Sample)
6,000 or fewer	4	One from each end and one from each side	X / X / X
6,001 to 12,000	6	One from each end and two from each side	X X / X X / X
12,001 or greater	8	One from each end and three from each side	X X X / X X X / X

NOTE: Sample between one and three feet into native soils below the pad and the backfill area.

Closure Report Forms

Within 45 days of UST permanent closure, the DNR closure report is due. Owners and operators usually contract with the CGP to complete the DNR's closure report form since they supervised the collection of soil and groundwater samples, submitted them to the lab and received the sample results. The closure report form is included on the following page. The form is also on the UST Section website.

Complete all sections of the closure report form and attach the information in the appendices on page 5 of the closure report form. The closure report covers all the required information needed in order to properly close the UST system. The UST Section will respond to the closure report if it is a non-active LUST site, otherwise the report will be forwarded to the LUST project manager who will compare the sample results from the closure with the Tier 1 or Tier 2 results.

Underground Storage Tank Closure Report-
Tank and Piping Removal
for the Iowa Department of Natural Resources

UST Registration		**LUST** *(if applicable)*	

Site Name:		
Site Address:	City:	Zip:
Contact Person:		Phone:

Owner Identification			
Name:		Company:	
Street:		E-mail:	
City:	State:	Zip:	Phone:

Iowa Licensed Remover			
Name:	Iowa Licensed Remover No:		Date:
Company:		E-mail:	
Address:			Phone:
City:	State:	Zip:	

Certified Groundwater Professional (CGP)			
Name:	Certification No:		Date:
Company:		E-mail:	
Address:			Phone:
City:	State:	Zip:	

Closure Sample Collector ***(if not the CGP listed above)***			
Name:			Date:
Company:		E-mail:	
Address:			Phone:
City:	State:	Zip:	

I certify that I have reviewed this document, appendices and attachments for submittal to the Iowa Department of Natural Resources. To the best of my knowledge, the information provided is true, accurate and complete.

Signature – ***OWNER***	Date	Signature – ***LICENSED REMOVER***	Date
Signature – ***CGP***	Date	Date Submitted	

Current Site Conditions

Description of the removed UST System and Tank Pit (This page may be photocopied if more than 6 tanks were removed)

Tank Number	1	2	3	4	5	6
Date Tank Removed						
Date Piping Removed						
Tank Size (gallons)						
Tank Length						
Tank Diameter						
Tank Age (approximately)						
Tank Contents						
Tank Construction Material						
Leak Detection Method Used During Active Life of Tank						
Number of Remaining Tanks:						
Will new USTs be installed at site? ☐ Yes ☐ No						
If *No*, and no tanks remain, what is planned future use of site?						

Excavation (Tank Pit) Condition

Surface Staining (Yes/No)						
Excavation Depth						
Excavation Length						
Excavation Width						
Free Product (Yes/No)						
Notable Odors (Yes/No)						
Soil Discoloration (Yes/No)						
Water in Tank Pit (Yes/No)						
Depth to Water						
Sheen on Water (Yes/No)						
Composition of Backfill Material						
Composition of Native Soil						

Exterior Tank Condition

Excellent/Good/Poor						

(X all that apply)

General Corrosion	☐	☐	☐	☐	☐	☐
Random Pitting	☐	☐	☐	☐	☐	☐
Perforations	☐	☐	☐	☐	☐	☐
Location of perforations on tank	☐	☐	☐	☐	☐	☐
Stress-Corrosion Cracking	☐	☐	☐	☐	☐	☐
Possible Leak Locations						

Piping Condition *(see tank condition)*

Piping Construction Material	
Possible Leak Locations	

Tank Cleaning and Disposal						
Tank Cleaning Method Used						
Final Disposition of Sludge and Wastewater						
Contractor Responsible for Tank Cleaning/Disposal (Name/Address/Phone)						
Tank Disposal Location						
Tank Number	1	2	3	4	5	6
Quantity of Surplus Product Removed From Tanks (gallons)						
Final Disposition of Surplus Product						

Disposal / Treatment of Backfill	
Volume of soils disposed (yds^3 or tons)	
Location where soils were disposed or treated (attach copy of land application form if appropriate)	

Soil Analytical Summary *(mg/kg)*

Complete the table below with soil analytical data for each sample. Attach laboratory analytical results, including completed chain of custody form(s) as Appendix 3.

Sample I.D.	Date Sampled	Depth of Soil Sample	Field Screening (ppm)	Benzene	Toluene	Ethyl-benzene	Xylenes	TEH Diesel	TEH Waste Oil

Was there an odor or visible staining noticed from any of the soil samples? If so which samples?

Was bedrock present?

Was the backfill returned to the tank pit?

Groundwater Analytical Data *(ug/L)*

Complete the table below with groundwater analytical data for each boring/monitoring well. Attach laboratory analytical results, including completed chain of custody form(s) as Appendix 3.

Sample I.D.	Date Sampled	Field Screening	Benzene	Toluene	Ethylbenzene	Xylenes	TEH-Diesel	TEH-Waste Oil

Was there a petroleum sheen or odor noticed from any of the groundwater samples? If so, which samples?

Discussion/Recommendations (based on lab results and visual observations):

Supporting Documentation And Information

Attach these Items to the Closure Report

Appendix 1. Dimensioned Site Diagram:

a. Location of all USTs, piping runs and dispenser islands
b. Sampling locations/identification that correspond to the laboratory analytical reports
c. Boring/monitoring well locations
d. Location of buildings and above ground tanks and piping on the site (include size and contents of ASTs)
e. Groundwater flow direction (if unknown, estimate and explain how determined)
f. North arrow
g. Scale of the diagram in feet (or at least provide distances in feet)
h. Dimensions of: 1) excavation pit area (NB: over excavation is limited to one foot of contaminated soils. A soil sample must be collected after over excavation from the area showing the greatest contamination)
i. Location of underground utilities within 100 feet of the site (e.g., sanitary sewers, public/private wells, power lines, storm sewers, utility trenches, water lines, pipelines, etc.)

Appendix 2. Soil Boring Logs / Monitoring Well Construction Diagrams

Stratigraphic logs of the boreholes and construction details of the well (see attached log), and disposition of the monitoring well after sampling

Appendix 3. Laboratory Analytical Results

Certified laboratory analytical results for each sample, including completed chain of custody form(s)

Appendix 4. Tank Tags

Remove tank tanks and return them with closure report

Appendix 5. Tanks and Tank Cleaning

a. Tank cleaning/disposal (e.g., signed statement from the party who performed the cleaning service indicating the UST was cleaned, and a certificate of disposal from the receiving facility
b. b. Documentation of sludge/wastewater disposal (e.g., signed statements, copies of permits)
c. Photographs of the cleaning of the tanks

Appendix 6. Soil and Water Disposal

a) Documentation of the proper disposal of contaminated soil (e.g., landfill disposal receipts, weight tickets
b) Documentation of the proper disposal of contaminated pit water, including: singed statement of permission from the POTW prior to disposal;
c) Documentation of wastewater characterized by the POTW, and
d) Appropriate documentation that the wastewater was accepted by the POTW

Color Photographs

a. Photos before excavation
b. Ends and sides of all tanks
c. Cleaned interior of tanks
d. Tank pit floor and sidewalls
e. Product line and dispenser trenches
f. Bedrock if exposed
g. Sealed USTs/product lines that are closed in place
h. Photos after completion of closure
i. Descriptions of photos
j. Disk of color photos

Soil Boring Log and Monitoring Well Construction Diagram		
*Boring/Well Identification:	UST Registration No:	LUST No:
**Boring Depth (ft) X Diameter (in):		Well Owner's Name:
Start Date:	Finish Date:	Drilling Method:
Permanent Well: ☐	Temporary Well: ☐	Depth to Static Water Level:
Total Depth of Well:	Depth to Bedrock:	Top of Casing:
Drilling Company:		Top of Screen:
Company Address:		City, State, Zip:
Certified Driller's Signature:		Logged by:
Driller's Registration Number:		Date Logged:

Depth (feet)	Well Construction Sketch	Sample No.	Sample ***Type	PID / FID Reading	Rock Formations, Soil, Color and Classifications, Observations (moisture, odor, etc.) First column for USCS

* Example: MW-1 or SB-1

**Example: 15 feet x 7 inches

*** Hollow Stem Auger (HS), Split Spoon (SS), Continuous Core (CC)

Examples of Observations (right column):

Cement; rock; crushed gravel/fill material; black silt, loose, moist; sands, moist, brown, firm; sand, dark gray, moist, petroleum odor; clay, sandy, brown, dry; gravely sand, dry; silty sands, mosit

08/2009 cmz

DNR Form 542-1392

Underground Storage Tank Closure Report-
Filling In Place
for the Iowa Department of Natural Resources

UST Registration		**LUST** *(if applicable)*	

Site Name:		
Site Address:	City:	Zip:
Contact Person:		Phone:

Owner Identification			
Name:		Company:	
Street:		E-mail:	
City:	State:	Zip:	Phone:

Iowa Licensed Remover			
Name:	Iowa Licensed Remover No:		Date:
Company:		E-mail:	
Address:			Phone:
City:	State:	Zip:	

Certified Groundwater Professional (CGP)			
Name:	Certification No:		Date:
Company:		E-mail:	
Address:			Phone:
City:	State:	Zip:	

Closure Sample Collector ***(if not the CGP listed above)***			
Name:			Date:
Company:		E-mail:	
Address:			Phone:
City:	State:	Zip:	

I certify that I have reviewed this document, appendices and attachments for submittal to the Iowa Department of Natural Resources. To the best of my knowledge, the information provided is true, accurate and complete.

Signature – ***OWNER***	Date	Signature – ***LICENSED REMOVER***	Date
Signature – ***CGP***	Date	Date Submitted	

Current Site Conditions						
Description of the UST System and Site Conditions *(This page may be photocopied if more than 6 tanks were removed)*						
Tank Number	1	2	3	4	5	6
Tank Size						
Number of Samples Collected for Each Tank						
Tank Contents						
Tank Construction Material						
Leak Detection Method Used During Active Life of Tank						
Date Tank Filled in Place						
Inert Material Used to Fill Tank						
Surface Staining? (Yes/No)						
Product Piping Removed?	☐ Yes ☐ No		Length of piping removed (in feet):			
(If "Yes" describe condition of piping, e.g., corrosion, perforations, stress cracks, good, poor, etc., and if any sign of a release was observed)						
Piping Abandoned in Place?	☐ Yes ☐ No					
Piping Construction Material:						
Number of Active Tanks Remaining:						
Reason for filling in place vs. removal:						

Tank Cleaning and Disposal						
Tank Cleaning Method Used						
Final Disposition of Sludge and Wastewater						
Contractor Responsible for Tank Cleaning/Disposal (Name/Address/Phone)						
Tank Disposal Location						
Tank Number	1	2	3	4	5	6
Quantity of Surplus Product Removed From Tanks (gallons)						
Final Disposition of Surplus Product						

Soil Analytical Summary *(mg/kg)*

Complete the table below with soil analytical data for each sample. Attach laboratory analytical results, including completed chain of custody form(s) as Appendix 3.

Sample I.D.	Date Sampled	Depth of Soil Sample	Field Screening (ppm)	Benzene	Toluene	Ethyl-benzene	Xylenes	TEH Diesel	TEH Waste Oil

Was there an odor or visible staining noticed from any of the soil samples? If so which samples?

Groundwater Analytical Data *(ug/L)*

Complete the table below with groundwater analytical data for each boring/monitoring well. Attach laboratory analytical results, including completed chain of custody form(s) as Appendix 3.

Sample I.D.	Date Sampled	Field Screening	Benzene	Toluene	Ethylbenzene	Xylenes	TEH-Diesel	TEH-Waste Oil

Was there a petroleum sheen or odor noticed from any of the groundwater samples? If so, which samples?

Discussion/Recommendations (based on lab results and visual observations):

Supporting Documentation And Information

Attach these Items to the Closure Report

Appendix 1. Dimensioned Site Diagram:

j. Location of all USTs, piping runs and dispenser islands
k. Sampling locations/identification that correspond to the laboratory analytical reports
l. Boring/monitoring well locations
m. Location of buildings and above ground tanks and piping on the site (include size and contents of ASTs)
n. Groundwater flow direction (if unknown, estimate and explain how determined)
o. North arrow
p. Scale of the diagram in feet (or at least provide distances in feet)
q. Location of underground utilities within 100 feet of the site (e.g., sanitary sewers, public/private wells, power lines, storm sewers, utility trenches, water lines, pipelines, etc.)

Appendix 2. Soil Boring Logs / Monitoring Well Construction Diagrams

Stratigraphic logs of the boreholes and construction details of the well (see attached log), and disposition of the monitoring well after sampling

Appendix 3. Laboratory Analytical Results

Certified laboratory analytical results for each sample, including completed chain of custody form(s)

Appendix 4. Tank Tags

Remove tank tanks and return them with closure report

Appendix 5. Other Documentation. *Provide the following:*

d. Tank cleaning/disposal (e.g., signed statement from the party who performed the cleaning service indicating the UST is clean and copies of photographs taken during the closure
e. Invoice of solid, inert material used to fill tank in place

Color Photographs

k. Photos before fill in place
l. Ends and sides of all tanks
m. Cleaned interior of tanks
n. Tank pit floor and sidewalls
o. Product line and dispenser trenches
p. Bedrock if exposed
q. Sealed USTs/product lines
r. Photos after completion of closure
s. Descriptions of photos
t. Disk of color photos

Soil Boring Log and Monitoring Well Construction Diagram		
*Boring/Well Identification:	UST Registration No:	LUST No:
**Boring Depth (ft) X Diameter (in):		Well Owner's Name:
Start Date:	Finish Date:	Drilling Method:
Permanent Well: ☐	Temporary Well: ☐	Depth to Static Water Level:
Total Depth of Well:	Depth to Bedrock:	Top of Casing:
Drilling Company:		Top of Screen:
Company Address:		City, State, Zip:
Certified Driller's Signature:		Logged by:
Driller's Registration Number:		Date Logged:

Depth (feet)	Well Construction Sketch	Sample No.	Sample ***Type	PID / FID Reading	Rock Formations, Soil, Color and Classifications, Observations (moisture, odor, etc.) First column for USCS

* Example: MW-1 or SB-1

**Example: 15 feet x 7 inches

*** Hollow Stem Auger (HS), Split Spoon (SS), Continuous Core (CC)

Examples of Observations (right column):

Cement; rock; crushed gravel/fill material; black silt, loose, moist; sands, moist, brown, firm; sand, dark gray, moist, petroleum odor; clay, sandy, brown, dry; gravely sand, dry; silty sands, mosit

08/2009 cmz DNR Form 542-1392

APPENDIX A

QUALIFICATIONS FOR EXCLUDING GROUNDWATER SAMPLES FOR UST CLOSURES

If groundwater is encountered within ten feet (10') below the lowest level of the tank excavation, a groundwater sample is required. If groundwater is not encountered within ten feet (10') below the lowest level of the tank excavation, but sands or highly permeable soils are encountered, or there are other indications of potential for groundwater contamination, a groundwater sample or samples are required (see Section II, Part 2 of this guidance document).

CONDITIONS FOR EXCLUSION

If sands or highly permeable soils are not present in a boring located within 20 feet (20') downgradient from the tank excavation and groundwater is not encountered within ten feet (10') below the lowest level of the tank excavation, the certified well contractor's log and the results of a hydraulic conductivity test must be submitted with the closure report to the DNR. The hydraulic conductivity test must be conducted by a person knowledgeable in the performance and interpretation of such testing. The results of the test must indicate a conductivity rate less than 0.3 meter per day in order to exclude the groundwater sample requirement.

A hydraulic conductivity test, using a Geulph permeameter or an equivalent in situ constant head permeameter in a boring which terminates above the water table and ten feet (10') below the lowest level of the tank excavation is acceptable. If laboratory methods are used, collect undisturbed soil samples using a thin-walled tube sampler in accordance with the American Society of Testing and Materials (ASTM) Standard D1587. Samples shall be clearly marked, preserved and transported to the laboratory. The laboratory shall measure hydraulic conductivity using a constant-head permeameter in accordance with ASTM Standard D2434 or a falling-head permeameter in accordance with acceptable methodology.

DEFINITION OF HIGHLY PERMEABLE SOILS

1) Sands and highly permeable soils for the purposes of UST closures are defined as:

2) Soil materials classified by the Iowa Geological Survey Bureau as follows:
    a. **(CGg)** clean well sorted gravel greater than 0.25 inches in diameter
    b. **(CGs)** gravel with minor amounts of sand
    c. **(CGc)** clean sand
    d. **(CGp)** sand with minor amounts of pebbles or gravel

3) Vulnerable bedrock

4) Any soils having a hydraulic conductivity rate greater than 0.3 meter per day

APPENDIX B

ENCOUNTERING BEDROCK DURING GROUNDWATER SAMPLING FOR TANK CLOSURE

CERTIFIED WELL DRILLER AND GROUNDWATER PROFESSIONAL REQUIRED

For all tank closures, a groundwater sample is required from the first saturated groundwater zone. The monitoring well or boring must be positioned downgradient, outside of the tank pit, and not farther than 20 feet (20') from the tank pit. If the top of the water table is suspected to be within bedrock or if bedrock is encountered before groundwater during drilling activity, a certified well contractor must conduct the drilling and a certified groundwater professional must conduct the assessment and sampling activity.

SHALLOW BEDROCK ASSESSMENT

Before drilling for a groundwater sample, the groundwater professional must determine if there is a potential to encounter bedrock before groundwater. These potential areas include (1) areas where karst features or outcrops exist within one mile of the site and (2) areas with bedrock less than 50 feet from the surface. The purpose of this determination is to prevent drilling through contaminated subsurface areas thereby creating a preferential pathway to a bedrock aquifer.

If bedrock is encountered before groundwater, a Tier 2 SCR must be completed in accordance with the requirements in the Tier 2 SCR guidance document, and special bedrock procedures in Subrule 135.10(3). If the first encountered groundwater is above bedrock but near the bedrock surface, or fluctuates above and below bedrock, the groundwater professional should evaluate the sub-surface geology and aquifer characteristics to determine the potential for creating a preferential pathway. If it is determined the aquifer shows extraordinary variations or inconsistencies in groundwater flow, groundwater elevations across the site, hydraulic conductivities, or total dissolved solid concentrations among monitoring wells, a Tier 2 assessment using special bedrock procedures must be conducted. If the first encountered groundwater is above the bedrock with sufficient separation and aquifer characteristics to establish that it acts as a granular aquifer as provided in 135.10(3)"a", a Tier 1 assessment must be conducted as provided in this guidance.

FIELD SCREENING FOR CONTAMINATION

The groundwater professional must first identify the presence of petroleum contamination in the soil (overburden) through the use of field screening methods (e.g., PID, FID) in order to reduce the risk of spreading contamination to the bedrock aquifer and to determine an appropriate drilling method and monitoring well construction technique. If field screening indicates

contamination in the overburden, the most contaminated soil should be determined and selected for lab analysis. Owners and operators must report to the department the discovery of a release in accordance with IAC 567--135.6.

WHEN BEDROCK CONTAMINATION IS SUSPECTED

If the use of field screening indicates the presence of contamination in the overburden, the overburden must be isolated from the bedrock by installing a permanent casing before continuing drilling, sealing all the casing string with grout seal and seating the casing in the bedrock. Installation of a grout seal around all of the casing in the overburden and seating the casing in the bedrock should ensure the well will remain free of petroleum contamination. The casing should be set and all equipment removed and cleaned before continuing to drill to water.

The bedrock cuttings should be continuously screened for the presence of contamination. The bedrock boring may be cased or uncased depending on the friability of the bedrock material. After the first saturated groundwater zone is encountered, either a temporary well or permanent well may be installed, and a water sample collected for lab analysis.

CONTAMINATION IN THE OVERBURDEN WITH A CONFINING UNIT

While drilling into bedrock, if a substantial confining layer of material (e.g., shale) is encountered before groundwater, drilling should cease. The confining layer should trap groundwater as well as contamination from a release in the UST system. Construct a temporary well above the confining unit to collect a groundwater sample for lab analysis.

NO CONTAMINATION IN THE OVERBURDEN

When the presence of contamination in the overburden is not identified through field screening or analysis, an uncased groundwater monitoring well may be constructed, and a water sample from the bedrock aquifer may be collected for lab analysis.

USTs SET IN BEDROCK

If the UST is resting on bedrock, examine the tank pit for petroleum staining. If petroleum staining is present, remove all backfill material. If the base of the tank pit is bedrock, but the sidewalls are not bedrock and staining is present in the UST pit, collect a soil sample from each of the sidewalls (nearest the bedrock surface). Use field screening methods to locate the presence of contamination in the tank pit.

SUMMARY

Before a groundwater monitoring well is constructed in bedrock, a certified groundwater professional must evaluate the subsurface conditions of the UST site. The purpose of the evaluation is to determine the potential for product migration and groundwater contamination. Some of the geologic information necessary for an assessment will be difficult to know in advance. Therefore, a full assessment of the bedrock conditions may not be known until after the drilling is completed. The evaluation should contain the following information:

1) Type of bedrock
2) The competence of bedrock (if available)
3) A description of the potential for karst development at the site (if available)
4) The presence or absence of water in the tank pit and the water source
5) The depth to groundwater (if available)
6) The direction of groundwater flow (based on topography and knowledge of local geology)
7) A description of the stratigraphy present in the area, i.e., surficial aquifers vs. deeper aquifers, etc.

PLUGGING ABANDONED WELLS

All abandoned wells and borings that access groundwater must be plugged according to 567-Chapter 39. DNR Form 542-1226 must be completed and submitted to the department.

APPENDIX C

AFFIDAVIT

EXEMPT PRE-'74 TANKS
JANUARY 1, 1974 EXCLUSION

This section must be completed by the owner and notarized:

I, _____*(please print)*, being duly sworn, hereby certify that the following statements and all attached documents are true and accurate to the best of my knowledge.

1) I am the owner of _____ underground storage tanks as defined by Iowa Code Section 455B.471(6) located at the address of:

_____ in the

____ Quarter of Section _____, Township _____, Range _____ East/West

2) That these tanks were taken out of operation prior to January 1, 1974,

3) That these tanks have not contained a regulated substance since January 1, 1974,

4) That these tanks do not currently contain an accumulation of a regulated substance, and

5) The execution of this instrument is my voluntary act and deed.

_____ ____/____/____
Signature of Owner *(In Ink)* Date

STATE: _____ COUNTY OF _____ Sworn to and subscribed before me this _____ day of _____, _____	*(Seal)*
_____ Notary Public	My Commission Expires: _____

APPENDIX D

AFFIDAVIT

MONITORING RECORDS USED IN LIEU OF SOIL & WATER SAMPLING

This section must be completed by the owner and notarized:

I, _____*(please print)*, being duly sworn, hereby certify that the following statements and all attached documents are true and accurate to the best of my knowledge.

1) Approved leak detection as defined by Iowa Code Section 455B.135(5), is present on the underground storage tanks located the address of:

_____ in the

____ Quarter of Section _____, Township _____, Range _____ East/West

2) That the leak detection has been in proper operating condition since _____.*(date)*

3) That the leak detection has been in operation since _____.*(date)*

4) That there has been no indication of a release at this site, and

5) The execution of this instrument is my voluntary act and deed.

_____ _____/_____/_____

Signature of Owner *(In Ink)* Date

STATE: _____ COUNTY OF _____ Sworn to and subscribed before me this _____ day of _____, _____	*(Seal)*
_____ Notary Public	My Commission Expires: _____

Appendix E

Explosive Limits of Gases

Fuel Gas	"Lower Explosive or Flammable Limit" (LEL/LFL) *(%)*	"Upper Explosive or Flammable Limit" (UEL/UFL) *(%)*
Acetaldehyde	4	60
Acetone	2.6	12.8
Acetylene	2.5	81
Ammonia	15	28
Arsine	5.1	78
Benzene	1.35	6.65
n-Butane	1.86	8.41
iso-Butane	1.80	8.44
iso-Butene	1.8	9.0
Butylene	1.98	9.65
Carbon Disulfide	1.3	50
Carbon Monoxide	12	75
Cyclohexane	1.3	8
Cyclopropane	2.4	10.4
Diesel Fuel	1.3	6
Diethyl Ether	1.9	36
Ethane	3	12.4
Ethylene	2.75	28.6
Ethyl Alcohol	3.3	19
Ethyl Chloride	3.8	15.4
Fuel Oil No.1	0.7	5
Fuel Oil No. 6	1	5
Hydrogen	4	75
Isobutane	1.8	9.6
Isopropyl Alcohol	2	12
Gasoline	1.4	7.6
Kerosene	0.7	5
Methane	5	15
Methyl Alcohol	6.7	36
Methyl Chloride	10.7	17.4
Methyl Ethyl Ketone	1.8	10
Naphthalene	0.9	5.9
n-Heptane	1.0	6.0
n-Hexane	1.25	7.0

Fuel Gas	"Lower Explosive or Flammable Limit" (LEL/LFL) *(%)*	"Upper Explosive or Flammable Limit" (UEL/UFL) *(%)*
n-Pentene	1.65	7.7
Neopentane	1.38	7.22
Neohexane	1.19	7.58
n-Octane	0.95	3.20
iso-Octane	0.79	5.94
n-Pentane	1.4	7.8
iso-Pentane	1.32	9.16
Propane	2.1	10.1
Propylene	2.0	11.1
Silane	1.5	98
Styrene	1.1	6.1
Toluene	1.27	6.75
Triptane	1.08	6.69
p-Xylene	1.0	6.0

Note! The limits indicated are for gas and air at 68 °F (*20 °C)* and atmospheric pressure.[17]

[17] The Engineering ToolBox Website: http://www.engineeringtoolbox.com/explosive-concentration-limits-d_423.html.

Appendix F

REPORTING PETROLEUM RELEASES FROM UST SYSTEMS
Reporting Promptly Protects the Public and the Environment

I. Reporting Requirements for Releases

Iowa law requires owners and operators of UST systems to report a confirmed or suspected release of "regulated substances," which includes petroleum, to the DNR within 24 hours or within 6 hours if a hazardous condition exists [567 Iowa Administrative Code (IAC)—135.6 & Iowa Code section 455B.386].[18]

This guidance is intended to help owners and operators (and others) determine what is a suspected release versus a confirmed release, and under what conditions a release becomes a "hazardous condition" triggering the 6-hour reporting requirement to the DNR and the local enforcement authority.

II. What is a Suspected Release and What are the Reporting Requirements?

Even though there is no obvious visual or olfactory evidence of a release—such as stained soils or a strong hydrocarbon odor—the presence of other indicators may suggest a release has occurred from the UST system. Below are examples of conditions qualifying as a "suspected release":

1. Vapor or product is detected in vapor monitoring or groundwater monitoring wells used for leak detection.
2. Inventory control discrepancies indicate that a release may have occurred (a gain or loss of product greater than 130 gallons + 1% of throughput).
3. Alarms from automatic tank gauging (ATG) systems, interstitial monitors, sump sensors, automatic line leak detector, etc. indicate that a release may have occurred.
4. Statistical inventory reconciliation (SIR) results indicate either a *Fail* or two consecutive *Inconclusive.*
5. Unexplained loss of product.
6. Unexplained presence of water in the tank or sump.
7. Product dispensing equipment does not dispense product or dispenses product at a greatly reduced rate.

---

[18] Department Rules read as follows: **567—135.6(455B) Release reporting, investigation, and confirmation. 135.6(1)** *Reporting of suspected releases.* Owners and operators of UST systems must report to the department within 24 hours, or within 6 hours in accordance with 567—Chapter 131 if a hazardous condition exists as defined in 567—131.1(455B), or another reasonable time period specified by the department, and follow the procedures in 135.8(1) for any of the following conditions:
a. The discovery by owners and operators or others of released regulated substances at the UST site or in the surrounding area (such as the presence of free product or vapors in soils, basements, sewer and utility lines, and nearby surface water);
b. Unusual operating conditions observed by owners and operators (such as the erratic behavior of product dispensing equipment, the sudden loss of product from the UST system, or an unexplained presence of water in the tank), unless system equipment is found to be defective but not leaking, and is immediately repaired or replaced; and
c. Monitoring results from a release detection method required under 135.5(2) and 135.5(3) that indicate a release may have occurred unless:
(1) The monitoring device is found to be defective, and is immediately repaired, recalibrated or replaced, and additional monitoring does not confirm the initial result; or
(2) In the case of inventory control, a second month of data does not confirm the initial result.

8. Internal tank (periodic) inspection results reveal perforations, corrosion holes, weld failures, or other similar defects.

III. Suspected Release Investigation

Owners and operators must immediately investigate and confirm suspected releases. Make sure the monitoring device that declared a release is not defective and giving false indications of a release. If it is defective, get it recalibrated, repaired or replaced immediately and make sure subsequent monitoring shows no release. Your petroleum equipment service company is able to help you diagnose whether there is a problem with your monitoring equipment and whether the suspected release can be confirmed.

If the monitoring equipment is found to be operating properly, the suspected release or confirmed release must be reported to the DNR by phone or fax within 24 hours. Make sure to contact Emergency Response if the release creates a hazardous condition (see part VII. below). You should also contact your UST insurance company to inform them you have a suspected or confirmed release.

Shut down the product line if you suspect a release from the product piping (slow flow, failed test results, positive shutoff, alarm, etc.). Shut down the submersible pump and empty the tank if a sudden loss of product occurs from the tank or if test results indicate a "Fail."

If there is a suspected release that cannot be explained due to defective monitoring equipment or the source of the release is unknown or uncertain, regulations require you to test your UST system to confirm if a leak has occurred. You must proceed with system tightness testing, which can detect a release at least as small as 0.1 gph in the tanks and/or product lines. If the precision test results are "Fail," a site investigation may be necessary. The DNR will issue a letter requiring a site check. You must repair or replace defective equipment if the test indicates a leak has occurred in the system. Submit documentation of the repair or replacement to the DNR (e.g., invoice, 148 form, and installation checklist if necessary).

IV. What is a Confirmed Release and What are the Reporting Requirements?

A release can be confirmed when based on visual and olfactory observations it is evident that petroleum or other regulated substances have breached the UST system or come in contact with the surface material (concrete/asphalt), backfill material, soil, groundwater or surface water or the system monitoring has confirmed a leak in the UST system that cannot be observed. The owner or operator must report the release to the DNR within 24 hours or six hours if a hazardous condition exists (see part VII below). Environmental evidence of a confirmed release includes:

1. Soil or groundwater sample analytical results for any petroleum constituent exceed the DNR's action levels [567—135.14].
2. There is a spill or overfill from the UST system.
3. There is an affected receptor (e.g., petroleum discovered in a utility trench, which can be attributed to the UST facility or the UST facility cannot be ruled out as a source).
4. Drinking water supplies are contaminated, which can be attributed to the UST facility or the UST facility cannot be ruled out as a source.
5. Vapors are observed in buildings or structures which can be attributed to the UST facility or the UST facility cannot be ruled out as a source.
6. Free product is observed in the environment or in monitoring well used for release detection or LUST monitoring.
7. Stained soil is observed.
8. A sheen is observed on surface water

V. Exceptions:

An aboveground release of petroleum from an UST facility does not need to be reported to DNR if it is less than 25 gallons, does not reach soil, groundwater or surface water, and is cleaned up within 24 hours and the facility retains records of the incident.

An overfill caused by a transporter filling an UST does not need to be reported to DNR if the spill is contained in the spill bucket of the UST and does not reach the backfill. A spill (e.g., a customer who overfills the vehicle's gas tank) of less than 25 gallons does not need to be reported if it is cleaned up within 24 hours and does not reach soil, groundwater or surface water. If a spill less than 25 gallons cannot be cleaned up within 24 hours, it must be reported.

VI. Confirmed Release Investigation

After reporting the confirmed release, take immediate action to prevent the spread of the release and danger to the public (e.g., fire, vapor and explosion hazards). If the public is in danger from a spill or overfill, immediately contact DNR's Emergency Response and the local enforcement authority. Shut down the pump for the suspected tank or product line. Investigate for free product in sumps and in under dispenser containment (UDC). Be mindful that you are investigating for the presence of flammable or combustible liquids. Avoid contact with the substance, and keep any ignition sources out of the area.

If the source of the release is the tank, contact your petroleum equipment service provider to have the tank emptied and to further investigate the problem. Upon receipt of the Release Report Form, the DNR will complete a Preliminary Leaking Underground Storage Tank (LUST) Report, the information will be entered into the database, and the owner/operator will receive a letter in the mail requiring a Risk Based Corrective Action (RBCA) assessment.

VII. What is a Hazardous Condition Requiring Reporting within 6 Hours?

A hazardous condition is defined in 567 IAC—131.1 and means any situation where a suspected or actual release of a hazardous substance, such as petroleum, places the health and safety of the public or the environment in danger.[19]

An example of a hazardous condition is product floating on the groundwater in the tank pit or in a monitoring well; a sheen of product on a lake, in a stream or a river; product discovered in a sump, a monitoring well, or in the UDC; more than 25 gallons of product overfilling or spilling onto the ground; vapors or product present in a building, sewer or utility line. In any of these situations, imminent or potential danger exists to the public or the environment and must be reported immediately.

An overfill that occurs during product delivery and which is not contained by the spill bucket must be reported immediately by the transporter (See 567 IAC—135.6(4) and 567 IAC—131.1). A release of a hazardous substance must be reported within 6 hours.

Releases of petroleum from non-regulated sources such as heating oil tanks, aboveground storage tanks, and farm and residential tanks must also be reported to DNR within 6 hours if a hazardous condition exists. To report a release, contact Emergency Response, the field office in the region where the release occurred, and the UST Section at the DNR central office.

1. Emergency Response: (24 hour phone) 515.281.8694 or fax 515.725.0218
2. DNR Field Offices: (http://www.iowadnr.gov/fo/fomap.html) (See table below.)

[19] *"Hazardous condition"* means any situation involving the actual, imminent or probable spillage, leakage, or release of a hazardous substance onto the land, into a water of the state or into the atmosphere which, because of the quantity, strength and toxicity of the hazardous substance, its mobility in the environment and its persistence, creates an immediate or potential danger to the public health or safety or to the environment.

Field Office	Phone	Fax	Field Office	Phone	Fax
1-Manchester	563.927.2640	563.927.2075	4-Atlantic	712.243.1934	712.243.6251
2-Mason City	641.424.4073	641.424.9342	5-Des Moines	515.725.0268	515.725.0218
3-Spencer	712.262.4177	712262.2901	6-Washington	319.653.2135	319.653.2856

3. UST Central Office: (work hours phone) 515.281.8941 or fax 515.281.8895
4. Use the Release Report Form to fax within 24 hours or 6 hours: Release Reporting Form

VIII. It's Good Business: Don't Make a Release More Expensive or Complicated

Reporting suspected and confirmed releases promptly as required and as soon as it is known not only protects the public and the environment, but can save the owner/operator money and lower cleanup costs. When a release is reported in a timely manner and the release investigation is begun quickly, further spread of the contamination can be prevented.

Fields of Opportunities

STATE OF IOWA

CHESTER J. CULVER, GOVERNOR
PATTY JUDGE, LT. GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
RICHARD A. LEOPOLD, DIRECTOR

UST RELEASE NOTIFICATION FORM

(Completed by the UST Professional and Submitted to DNR UST Section and Owner/Operator)

A suspected or confirmed release has been identified at your property by your UST professional. Pursuant to Iowa Code section 455B.474 and 567 Iowa Administrative Code (I.A.C.) 135.6(1), **UST system owners and operators** are required by law to report suspected or confirmed releases to the Iowa Department of Natural Resources within 24 hours of discovery, or 6 hours if a hazardous condition exists, unless an exception applies. Please see the Department's Release Guidance at http://www.iowadnr.gov/land/ust/ustrelease.html for more information, including a Release Reporting Form.

If a confirmed release has been identified at your property, your UST Professional is required by 567 I.A.C. 134.22 to submit a copy of this form to the Department within seven days of discovery. This secondary submission does NOT excuse the owner/operator from making the initial reporting as discussed above and in the release guidance. Failure to directly report a suspected or confirmed release may result in the Department taking enforcement action against the owner/operator, to include the assessment of a monetary penalty.

For suspected and confirmed releases, notify the Iowa Department of Natural Resources at the number listed at the bottom of this form. For hazardous conditions, notify the Department and your local law enforcement.

SITE INFORMATION	
Site Name:	UST No:
Site Address:	
City:	ZIP Code:

NOTIFIED PARTY		
Owner/Operator Name:		
Notification form sent to (address):		
City:	State:	ZIP Code:
Owner/Operator Phone Number:		
Date Notified Orally:	Date Notified by Mail:	
Owner/Operator Signature:		

UST PROFESSIONAL		
Iowa UST Professional Name:		
Company:	Phone Number:	
Company Address:		
City:	State:	ZIP Code:
Iowa UST Professional Signature:		

RELEASE		
☐ Confirmed Release ☐ Suspected Release		Date Discovered:
Leak Status: ☐ Continuing ☐ Stopped ☐ Unknown		
Description:		
Recommended Action:		

WALLACE STATE OFFICE BUILDING / 502 EAST 9th STREET / DES MOINES, IOWA 50319-0034
515-281-5918 FAX 515-281-8895 www.iowadnr.gov

Fields of Opportunities

CHESTER J. CULVER, GOVERNOR
PATTY JUDGE, LT. GOVERNOR

STATE OF IOWA

DEPARTMENT OF NATURAL RESOURCES
RICHARD A. LEOPOLD, DIRECTOR

UST RELEASE REPORT

UST# _____

LUST # _____

RELEASE REPORT INFORMATION

RELEASE REPORTED BY: _____

COMPANY: _____ PHONE: _____

ADDRESS: _____

CITY: _____ STATE: _____ ZIP: _____

DATE RELEASE DISCOVERED: _____ DATE RELEASE REPORTED: _____

SITE INFORMATION

SITE NAME: _____

SITE ADDRESS: _____

CITY: _____ COUNTY: _____ ZIP: _____

FACILITY OWNER INFORMATION

OWNER/OPERATOR NAME: _____

COMPANY NAME: _____

OWNER/OPERATOR STREET ADDRESS: _____

CITY: _____ STATE: _____ ZIP: _____

OWNER/OPERATOR PHONE NUMBER: _____

PROPERTY OWNER INFORMATION *(if different than facility owner)*:

PROPERTY OWNER NAME: _____

COMPANY NAME: _____

PROPERTY OWNER STREET ADDRESS: _____

CITY: _____ STATE: _____ ZIP: _____

PROPERTY OWNER PHONE NUMBER: _____

RELEASE INFORMATION

SUBSTANCE RELEASED:

- ☐ E-85
- ☐ HEATING OIL
- ☐ GASOLINE
- ☐ DIESEL
- ☐ WASTE OIL
- ☐ BIODIESEL
- ☐ KEROSENE
- ☐ OTHER: _____

ESTIMATED AMOUNT OF SUBSTANCE RELEASED: _____

HOW WAS RELEASE DISCOVERED:

- ☐ UST Closure
- ☐ Field Office Visit
- ☐ Environmental Audit
- ☐ UST Inspection
- ☐ Vapors Detected
- ☐ Sump Sensor
- ☐ Line Leak Detector
- ☐ Citizen Complaint
- ☐ Service Visit
- ☐ Line Tightness Test
- ☐ Tank Tightness Test
- ☐ Site Check
- ☐ Cathodic Protection Testing
- ☐ Inside Secondary Containment Sump
- ☐ Tank Leak Detector *(Indicate Method)*: _____
- ☐ Other *(Please Specify)*: _____

CAUSE OF RELEASE:

☐ Flex Connector

☐ Install Problem ☐ Overfill ☐ Spill by Customer ☐ Physical/Mechanical Problem

☐ Dispenser Leak ☐ Tank Leak ☐ Line Leak ☐ Leak Detector

☐ Corrosion ☐ Unknown ☐ Other: _____

SOURCE OF RELEASE:

☐ Tank ☐ Piping ☐ Submersible Turbine Pump

☐ Delivery Problem ☐ Dispenser ☐ Other *(Specify)*: _____

PRODUCT DELIVERY: ☐ Pressurized ☐ Suction ☐ Safer Suction

PIPING MATERIAL: ☐ Steel ☐ Fiberglass ☐ Flex

BRIEF DESCRIPTION OF THE RELEASE:

Briefly describe the release (including but not limited to where release was discovered, amount of free product present, location of free product). Provide/attach a sketch of the location of the release (specific or general location).

MEDIA AFECTED BY RELEASE:

☐ Surface Soil ☐ Subsurface Soil ☐ Drainage Ditch ☐ Public Water Supply Well

☐ Storm Sewer ☐ Groundwater ☐ Sanitary Sewer ☐ Non-Potable Water Supply Well

☐ Vapors Inside Offsite Commercial Building ☐ Vapors Inside Residence ☐ Domestic Water Supply Well

☐ Vapors Inside Onsite Commercial Building ☐ Creek/Stream/River/Lake ☐ _____

RESULTS OF EXPOSURE ASSESSMENT (if immediately available):

How many private drinking water wells are located with 1,000 feet of site? _____

How many public water supply wells are located within 1,000 feet of the site? _____

Have any drinking water supply wells been affected by contamination from this release? ☐ Yes ☐ No

Is there imminent threat of contamination to any drinking water wells? ☐ Yes ☐ No

Have vapors or contaminated groundwater posed a threat to the public? ☐ Yes ☐ No

Are any underground utilities affected or imminently threatened by the release? ☐ Yes ☐ No

Have any surface waters been affected by the release? ☐ Yes ☐ No

Is there an imminent threat of contamination to surface waters? ☐ Yes ☐ No

What is the type of surrounding population? *(Commercial, Residential, Industrial)* _____

~ATTACH OTHER COMMENTS AS NECESSARY~

REPORT RELEASES TO IOWA DNR CENTRAL OFFICE

EMERGENCY RESPONSE	DNR – UST SECTION
Phone: 515/281-8694	**Phone: 515/281-8941**
Fax : 515/725-0218	**Fax: 515/281-8895**

Overnight Mailing Address: DNR UST Section, Wallace State Office Bldg., 502 E 9TH ST, Des Moines, IA 50319-0034

REPORT RELEASES TO APPROPRIATE DNR FIELD OFFICE

Field Office	Phone	Fax	Field Office	Phone	Fax
1-Manchester	563.927.2640	563.927.2075	4-Atlantic	712.243.1934	712.243.6251
2-Mason City	641.424.4073	641.424.9342	5-Des Moines	515.725.0268	515.725.0218
3-Spencer	712.262.4177	712262.2901	6-Washington	319.653.2135	319.653.2856